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OSTEOMYELITIS

BY F. H. BAETJER, M.D.

Major Medical Reserve Corps, U. S. A.

BALTIMORE, MD.

IN a normal long bone we have a medullary canal containing the blood supply, nerves, lymph vessels and marrow fat. Then we have the dense hard bone surrounding this which we call the cortex, this, in turn, being covered by a fibrous sheath, the periosteum; and at each end of the bone we have the joint surface, namely, a cartilaginous covering. Any one or all of these structures may be involved in an inflammatory process. When the periosteum is involved we have a periostitis; when the infection is confined to the cortex we have an osteitis; an infection of the medullary canal is a myelitis. The combination of diseased cortex and medullary canal we speak of as an osteomyelitis.

While the pyogenic factor may vary in bone infection, the process is the same, varying only as to the severity and duration of the infection. Before taking up the changes that occur, it is well to bear in mind just how the infection reaches the bone, as the roentgenological picture varies according to the point at which the infection starts. In a general way we may speak of four portals of entry:

1. Hemotogenous or lymphoid in origin.
2. Infection lodging beneath the periosteum.
3. Arising in the joint.
4. Direct inoculation, as in wounds and compound fractures.

In the first group, the blood or lymph supply carries the infection through the nutrient canal into the medullary portion of the bone; and since this is filled with the soft marrow fat the infection may spread easily and rapidly up and down the medullary canal. (Fig. 1.) In this condition the changes take place within the bone; the cortex and periosteum are not involved in the early stages.

When the infection lodges beneath the periosteum we have it and the bony cortex involved. (Figs. 2 and 3.) Since the cortex is quite dense, the infection is more or less limited and does not tend to spread; consequently in this type the medullary canal is not often involved, but we have an extensive periostitis and osteitis. (Fig. 4.)

When the infection starts in the joint we have extensive destruction of both articulating surfaces, and finally the disease breaks through one of the cartilaginous surfaces and destroys to a more or less degree the head of the bone, where cancellous bone is present; and here again the infection extends but slowly into the medullary canal proper. In compound fractures the infection is carried directly to the medullary canal and raw exposed

bony surfaces, so that periosteum, cortex and medullary canal may be involved simultaneously.

The question naturally arises, Does osteomyelitis give us a constant roentgenological picture? The answer must be "No"; but we may qualify our "no" by stating that the pathological process is the same and that if we understand the fundamental principles of bone infection, while the pictures may vary, yet one will recognize the condition.

FIG. 1. INFECTION STARTING IN THE MEDULLARY CAVITY. NOTE PERIOSTEAL BRIDGE AND NEW BONE.

FIG. 2. SHOWS DENSE CORTICAL BONE, DUE TO INFECTION BENEATH PERIOSTEUM.

There are only two changes that take place, namely, bone destruction and bone reproduction. It is the variation in these two processes upon which we make our diagnosis. We must remember that normal bone is pierced by numerous small Haversian canals and that these are in direct connection with the medullary canal. Now, an infection that starts in the medullary canal not only extends up and down, but also into the Haversian canals. If the infection is virulent we soon get evidence of bone destruction, confined at first to the Haversian canals, and finally by extending down these canals, the infection will completelv surround a portion of bone, thus devitalizing it, and we have the formation of a sequestrum (Fig. 5). If the infection is virulent, this takes place rapidly, and the most marked changes are those of bone destruction with but little new bone formation. We must remember that new bone formation is a repair process and does not take place until nature is getting the mastery of the infection. We must also bear in mind that in the very early stage of even a virulent bone infection the bone may be perfectly normal in

appearance upon the roentgen-ray plate, but at operation we shall find the little canals that traverse the bony structure completely filled with pus. No bone destruction has as yet taken place, and consequently the roentgen-ray plate will be negative. Such a case examined a few days later will show beginning destruction. Care must be taken not to mislead the surgeon in such a case by reporting a negative plate.

FIG. 3. ACUTE INFECTION BENEATH PERIOSTEUM. CORTEX DESTROYED. MEDULLARY CAVITY INTACT.

In an acute osteomyelitis we get the following picture upon a roentgen ray plate. The infection, having lodged in the medullary cavity, takes the path of least resistance and extends along the medullary cavity, and we get vacuolated spaces represented by areas of lessened density. The infection now spreads to the bony cortex and travels irregularly by means of the little bony canals, so that we may have areas of bone destruction with normal bone in between, and eventually these areas of normal bone will become cut off and form sequestra. This is an important point of differential diagnosis, because every pathological process in bone must be viewed as a possible malignancy until proved otherwise. Malignancy in long bones starts from one central point and radiates equally in all directions, absorbing the bone as the growth advances, but never appears as separate areas with normal bone in between.

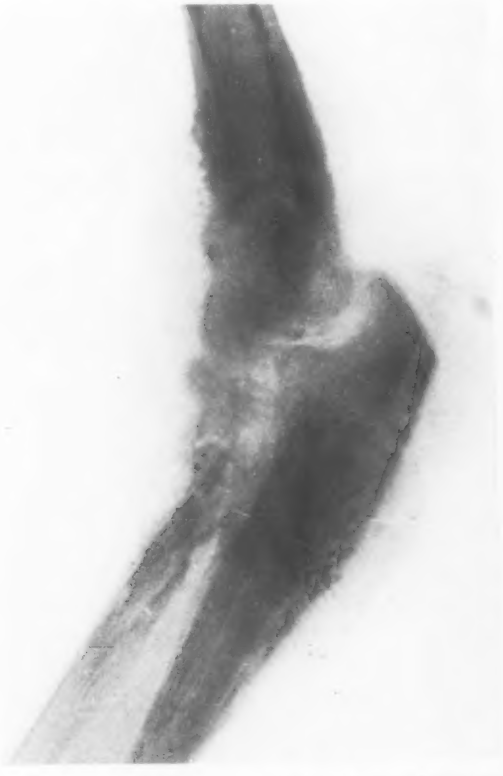

FIG. 4. INFECTION ARISING IN JOINT, THEN INVOLVING THE HEADS OF ALL THREE BONES.

The osteomyelitis infection will finally pierce the cortex in one or more places, leaving areas of normal cortex in between. Here again we have another important point of differential diagnosis, as in malignancy when the growth reaches the cortex it destroys it completely as a whole, and not in parts, as osteomyelitis does.

Thus far we have been discussing the acute destructive process; but with the piercing of the cortex and the acquired resistance of the tissues, nature now attempts to limit the destructive processes, and this is done by building up a new bony wall at the edge of the infection. To produce bone reaction there must be a stimulation, and the point of stimulation is always at the point where the infection

FIG. 5. VIRULENT INFECTION SHOWING EXTENSIVE DESTRUCTION AND VERY LITTLE BONE PRODUCTION.

stops and the normal bone begins; so we must look for our new bone production at the edges of the infection and not in the middle of it. The result of this will be that the new bone laid down will follow the edge of the infection. This gives us a varied picture, as the destruction will determine where the new bone will be laid down.

At the same time, the infection having reached the periosteum, we shall find extensive periosteal bone following, of course, the periosteum. This deposit of periosteal bone will frequently be sufficiently great to give the appearance of expansion of the bone. Close inspection, however, will reveal that the apparent expansion is in reality due to deposition of bone on the outside. This too, is an important point, as benign growths of the bone, such as cysts and osteochondromata, invariably expand the cortex, while osteomyelitis does not.

The predominating feature in acute

FIG. 6. ENORMOUS PRODUCTION OF DENSE BONE, MEDULLARY CANAL OBLITERATED, SEQUESTRUM AT LOWER END.

osteomyelitis is bone destruction with but little new bone production. In chronic osteomyelitis the conditions are exactly reversed. We have excessive bone reproduction with a few small areas of destruction. The entire bone is thickened, frequently to such an extent that the medullary cavity seems to be completely obliterated (Fig. 6). The bone is often irregular in shape and much thickened, due to extensive deposition of periosteal bone upon the cortex. In the bone there may be

small areas due to little focal spots of infection. From this brief description it will be readily seen that we have no one definite roentgen ray picture, but that the changes will depend entirely upon the virulence of the infection, the stage of the disease and the resistance of the patient. The following points must always be carefully noted:

1. The place where the infection starts.
2. The character of the destructive process.

FIG. 7. ENTIRE SHAFT IS A SEQUESTRUM, DENSE NEW BONE FORMING INVOLUCRUM. NOW READY TO BE OPERATED UPON.

3. The path of extension, that is, spreading equally in all directions or following the path of least resistance.
4. The character and situation of new bone production.
5. The condition of the cortex, whether it is intact, destroyed as a whole or pierced by sinuses, expanded or not.

Thus far we have discussed only the infections arising from pyogenic organisms. We have one infection of constitutional origin which is extremely common, namely, luetic osteomyelitis. In this condition the changes are frequently identical with those of pyogenic origin. There are two points, however, that assist us in making a correct diagnosis. First, the lesions are generally observed in more than one bone; and second, the clinical picture does not coincide with that given by the roentgen ray. In lues the plate may show an apparently very acute osteomyelitis, evidenced by extensive destruction, the entire bone being involved, yet there will be but few clinical symptoms.

A careful study of the plate will give not only a correct diagnosis but it gives further information to the surgeon. It not only tells the extent of the disease, and the presence or absence of sequestra, but it also determines the presence or absence of an involucrum (Fig. 7). This is of great importance, as it frequently determines the character of the operation necessary. For example, in an acute osteomyelitis, where practically the entire bone is involved, it will be necessary to take away all the diseased bone to cure the patient. Now if the plates show that no involucrum has formed, the surgeon will confine himself to opening the bone to get free drainage and will do the radical operation later, after the involucrum has formed.

We have emphasized the fact that our diagnosis is based upon bone destruction and production, arising from infection. If any other cause has been added to the infection, particularly surgical interference, we may draw erroneous conclusions, because our apparent bone destruction may not be due to disease but may be the result of the surgeon's curette; and furthermore, our new bone production may take place in the normal bone through which the surgeon passed to reach the infection. It is always well to know beforehand in any bone lesion whether there has been surgical interference. One should always be extremely guarded in giving a diagnosis in such a case.

COEXISTING MULTIPLE LESIONS AS CAUSES OF DIAGNOSTIC ERRORS OF OMISSION *

BY A. W. CRANE, M.D.

KALAMAZOO, MICH.

GENERAL usage has sanctioned the terms clinical diagnosis, physical diagnosis, laboratory diagnosis and *x*-ray or roentgen diagnosis. Usage overrides every other consideration and these terms are not likely to be discontinued. They both reflect and mould current conceptions of diagnosis. The idea largely prevails that the pathologic process from which the patient suffers may be investigated by these several methods and thus the diagnosis formulated from symptoms may be confirmed by physical signs, laboratory procedures or roentgen ray methods. Many clinicians from pride of craft habitually confine their diagnostic inquiries mostly to histories, symptoms and physical signs. But the roentgen diagnostician is equally at fault in presenting and emphasizing diagnoses made exclusively by the roentgen rays. Thus we learn to expect a diagnosis to be stated in single terms, viz., pulmonary tuberculosis, duodenal ulcer, gallstones, etc.

An eminent clinician and teacher in one of our great medical schools has stated recently: "There is a general diagnostic law which it is well to hold to in any case, and that is, but one pathologic process ever assails an individual. To be sure, such a pathologic process may have several associated and secondary conditions growing out of the primary one; but the general rule holds true."[1] As we read his clinics we are more than half convinced by the brilliant analysis of each case and the unrivaled synthesis whereby the diagnosis is clearly and inevitably constructed before our eyes out of symptoms pure and undefiled by either a gastric analysis or a roentgen ray plate.

If it were true that a patient never had but a single disease at a time, then any single method of diagnosis which detected this disease would be sufficient. Thus the symptoms and history alone may be sufficient in a case of gallstone colics, physical signs alone may be sufficient for a valvular disease of the heart, the laboratory examination alone sufficient for a pernicious anemia and the roentgen rays alone for a vesical calculus. A clean-cut diagnosis, such as a pulmonary abscess, a gastric ulcer or a nephritis, which explains symptoms will commonly be accepted as a proper basis for treatment, medical or surgical, and further diagnostic investigation be deemed unnecessary.

It is the burden of this paper to show that a single pathologic process is not the rule in chronic cases and that the true diagnostic concept is not a demonstration of a single lesion, although it may be the lesion which causes the symptoms, but a demonstration of every pathologic process or condition that can be found in the case. Single methods of examination cannot be relied upon no matter how skillfully employed. All must be practiced. This is too obvious to require examples. Multiple lesions are found in more than 50 per cent of cases and many failures of treatment are due to undiscovered lesions whose presence and influence may be overlaid and overshadowed by a more demonstrative process.

These conclusions were reached by a review of 781 recent cases examined in collaboration with my partner, Dr. John B. Jackson, in which the case records cover symptoms, physical signs, laboratory findings and roentgen ray studies. We have classified these cases as follows:

(1) Those having a single pathologic process present:

Number, 386 Per cent, 49

[1] *Medical Clinics of Chicago*, Vol. II, No. 4, January, 1917, pp. 787–788.

* Read at the Nineteenth Annual Meeting of the American Roentgen Ray Society, September, 1918.

(2) Those having two or more pathologic processes present:

Number, 395 Per cent, 51

We may consider that for our series the two classes are each 50 per cent. If our examinations had been sufficiently searching it is probable that the percentage of single lesions would have been still further reduced. On the contrary, if our analysis of each case had been made with sufficient knowledge and discernment, it is equally probable that many apparently separate lesions would have been found to be in reality related effects of a single pathologic process.

Our first division of cases showing a single pathologic process may be subdivided into (*a*) 338 cases having a single organ affected, as for example pulmonary tuberculosis; and (*b*) 48 cases having two or more organs affected, as for example pulmonary tuberculosis and renal tuberculosis in the same patient, or arthritis and endocarditis, etc. These latter are coexisting multiple lesions but would not violate the dictum quoted at the beginning of our thesis.

The 395 cases of multiple lesions which do confute this dictum may be subdivided into (*a*) 122 cases having several diseases which form chains of cause and effect, and (*b*) 273 cases which have two or more unrelated diseases forming true multiple lesions.

Table

Compilation from Case Records	No. of Cases	Per Cent
1. Single pathologic processes	386	49
(*a*) affecting single organs	338	43
(*b*) affecting several organs	48	06
2. Multiple pathologic processes	395	51
(*a*) In chains of cause and effect	122	16
(*b*) Unrelated	273	35

It is obvious that the more chronic the case the more probable is the existence of multiple lesions. Nevertheless acute diseases may be multiple, as for example pneumonia in the course of influenza, the two diseases having distinct etiologies. Gonorrhea and syphilis may coexist. Typhoid and malaria, though rare, have been demonstrated in the same patient. An acute may be grafted upon a chronic disease. The writer had a case of pulmonary tuberculosis with tubercle bacilli in the sputum who exhibited periodic paroxysms of the malarial type. This would seem consistent with the usual septic complications of tuberculosis. But we were able to demonstrate the plasmodium in the blood, and the blood findings were verified by Dr. George Dock, at that time professor of medicine at Michigan University.

Cases showing a single pathologic process affecting several organs are to our surprise much the least numerous of our series. The distinctions between a single disease affecting several organs and a chain affecting several organs may be absent in some cases. A pyorrhea with an endocarditis and an arthritis may be considered in either class. Where they coexist we have classified them as a single disease affecting different organs.

If, however, an appendicitis leads by reflex action to gastric hyperacidity and ulcer, this is clearly a chain. Coexisting multiple diseases in chains of cause and effect are among the most interesting of our series. Chains of this sort may be of considerable length and somewhat theoretical.

Such a chain is seen in gallstones with diabetes. The initial lesion may have been a typhoid fever causing a cholecystitis. From the cholecystitis result gallstones. As is well known, living typhoid bacilli have been grown from the nuclei of gallstones. From an impacted stone in the common duct result a temporary occlusion of the pancreatic duct with the production of a low grade pancreatitis and ultimately a diabetes from a disturbance of the internal secretion of the pancreas, as shown by Opie many years ago. As a predisposition of the diabetes, pulmonary tuberculosis may supervene or it may be a gangrene or yet a destructive lesion of the phalanges of the big toe. The roentgenologist may find himself in on the case because of the gallstones, or the pul-

monary complication, or perhaps because of the necrosis of a bone in one toe. If a diagnosis were attempted without a survey of the case it is easy to see how misleading might be the apparent indications for treatment.

The diagnostic chain may connect other organs in quite a different direction. The gallstones which may have resulted from other causes than typhoid fever may by a well-known reflex effect disturb the gastric secretions, setting up a gastric hyperacidity. Sooner or later in a certain proportion of cases there arises a duodenal ulcer. We will not say that the hyperacidity causes the ulcer. It is indeed surprising to see how many causes of peptic ulcer have actually been demonstrated and how various are the opinions of able clinicians concerning the causation of ulcer. But it is beyond dispute that the overwhelming majority of ulcers are associated with hyperacidity, so that our diagnostic chain remains unbroken whatever may be the nature of the intermediate links. To treat the ulcer either medically or surgically without reference to the gall bladder is obviously illogical.

Again, the gallstones may be finally associated with the cancer of the gall ducts and liver and lead to carcinoma of the lungs. In one of our cases the pulmonary metastasis was present at an early stage, and was the deciding factor against operation for the gallstones. In another case, although gallstones showed clearly on the roentgen plates, a carcinoma of the stomach was also demonstrated which materially altered the original surgical program.

A diagnostic chain which closely concerns the roentgenologist at present begins with dental sepsis as shown on tooth films, and may result in several simultaneous lesions such as an arthritis, a cardiac valvular lesion and a nephritis. Of the forms of arthritis thus caused we may especially mention spondylitis deformans because of the frequency with which the pains of this affection are mistaken for those of thoracic, abdominal or renal diseases. The septic focus may be a tonsil, an infected sinus, a salpingitis, etc., and the secondary lesion may involve any organ of the body.

In old chronic cases the diagnostic chain once perfect may have become broken and some of the links missing. The teeth may all have been extracted and the arthritis may be merely a matter of an indefinite case-history, and yet the nephritis may remain as a net result associated with a cardiac murmur marking the former endocarditis, and with a rising blood pressure by which nature is attempting to compensate for the contracting kidneys. Again, an appendix which had been the seat of repeated inflammation may have become obliterated or removed by operation, and yet the chronic dyspepsia which was initiated as an appendiceal pylorospasm may remain.

When the list of disease entities in any case contained two or more which could not be logically connected in the chain of cause and effect, then the case was classified under the head of coexisting pathologic processes. This was the classification even though a chain were also present. This class constituted 35 per cent. The grouping of diseases follows no rule whatever. The variety is infinite. The lesions may be silent and quiescent or active and symptom-producing. The disease entities listed included not only diseases such as gastric ulcer, cholecystitis, epilepsy, but also such conditions as hernia, gastroenteroptosis, laceration of the cervix, scoliosis, etc.

Vascular hypertension occurring by itself is put down as a diagnosis, but when occurring with nephritis is considered as a symptom or secondary effect. The justification of this ruling is that when vascular hypertension is the only visible factor it may be named to designate the pathologic process. The same rule applies to anemia, hyperacidity, etc., which are secondary to many conditions. It may at times be questionable whether or not the hyper-

tension, etc., are primary causes in themselves.

We have classified gastritis with hyperacidity and duodenal ulcer as multiple lesions affecting two organs but it is easy to see that this might not be the classification of one who was guided by the fact that the bulbus duodeni is embyryologically a part of the stomach.

The number of coexisting pathologic conditions in some cases may at first excite amusement and incredulity in the minds of those accustomed to think of a diagnosis as a single pathological entity. Examples from our files are as follows:

Mr. L.
Chief Complaints
(1) Cough
(2) Epigastric pain
(3) Dysuria
Diagnostic Findings
(1) Pulmonary tuberculosis
(2) Dilatation of aorta
(3) Prostatic hypertrophy
(4) Gastric hyperacidity
(5) Duodenal ulcer
(6) Chronic appendicitis
(7) Anemia

Mrs. T.
Chief Complaints
(1) Melena
(2) Headaches
(3) Abdominal soreness
Diagnostic Findings
(1) Gallstones
(2) Hyperacidity
(3) Anemia
(4) Goiter
(5) Migraine
(6) Endocervicitis
(7) Pruritus vulvæ

Mrs. D.
Chief Complaints
(1) Left hypochondriac pain
(2) Tumor
Diagnostic Findings
(1) Hydronephrosis
(2) Mitral regurgitation
(3) Aortic aneurysm
(4) Vascular hypertension
(5) Myocarditis
(6) Achylia gastrica

Mrs. P.
Chief Complaints
(1) Epigastric pain
(2) Abdominal soreness
Diagnostic Findings
(1) Cholecystitis
(2) Gastric hyperacidity
(3) Pelvic inflammation
(4) Anemia
(5) Pyorrhea
(6) Vascular hypertension

Mrs. B.
Chief Complaints
(1) Right hypochondriac pain
Diagnostic Findings
(1) Renal calculus
(2) Cholecystitis
(3) Gastroenteroptosis
(4) Cystic kidney
(5) Gastric hyperacidity
(6) Anemia

Mrs. M.
Chief Complaints
(1) Dizziness
(2) Abdominal pain
(3) Constipation
Diagnostic Findings
(1) Cerebral syphilis
(2) Aortic dilatation
(3) Visceroptosis
(4) Gastric hyperacidity
(5) Cholecystitis
(6) Laceration of perineum
(7) Hemorrhoids

Miss I.
Chief Complaints
(1) Headache
(2) Unconsciousness
(3) Vertigo
Diagnostic Findings
(1) Epilepsy
(2) Migraine

(3) Tonsillitis
(4) Dental sepsis
(5) Anemia
(6) Sciatica

Mr. W.
Chief Complaints
(1) Epigastric pain
(2) Jaundice
(3) Dyspepsia
Diagnostic Findings
(1) Mitral regurgitation
(2) Prostatic hypertrophy
(3) Pancreatitis
(4) Gallstones
(5) Colonic stasis
(6) Pyorrhea

These are the most extreme examples which we could select. Shorter groups are the rule, such as:

Mrs. L.
Chief Complaints
(1) Dyspnea
(2) Nervousness
Diagnostic Findings
(1) Hyperthyroidism
(2) Pelvic tumor
(3) Vascular hypertension
(4) Pyorrhea

Mrs. B.
Chief Complaints
(1) Epigastric pain
(2) Pelvic pain
(3) Dysphagia
(4) Menorrhagia
(5) Leg pain
Diagnostic Findings
(1) Gastric hyperacidity
(2) Appendicitis—chronic
(3) Fibroid uterus

Mr. C.
Chief Complaints
(1) Dysphagia
(2) Nervousness
Diagnostic Findings
(1) Carcinoma of esophagus
(2) Hypertension
(3) Nephritis

Mr. S.
Chief Complaints
(1) Thoracic pain
Diagnostic Findings
(1) Angina pectoris
(2) Achylia gastrica
(3) Appendicitis

Mrs. H.
Chief Complaints
(1) Menorrhagia
(2) Headache
Diagnostic Findings
(1) Uterine fibroid
(2) Chronic appendicitis
(3) Laceration of perineum and cervix

Mr. M. C.
Chief Complaints
(1) Loss in weight
(2) Weakness
(3) Nausea
(4) Vomiting
(5) Constipation
(6) Abdominal pain
Diagnostic Findings
(1) Gallstones
(2) Duodenal obstruction
(3) Syphilis of the lungs

Mrs. J.
Chief Complaints
(1) Abdominal pain
(2) Gas eructation
(3) Lumbar pain
(4) Loss in weight
Diagnostic Findings
(1) Appendicitis
(2) Salpingitis

Mr. L.
Chief Complaints
(1) Dyspnea
(2) Epigastric pain
(3) Cough
(4) Weakness
(5) Loss of weight
Diagnostic Findings
(1) Duodenal ulcer
(2) Aortic regurgitation
(3) Chronic interstitial nephritis

Although a fair proportion of our surgical cases underwent operation, yet the majority were subjected neither to operation nor autopsy. While this is unfortunate for diagnostic figures, as a matter of vital statistics it will not be criticized by patients. However, the statistical use of our case records for the purpose of this study is not subject to a material factor of error. Much of the diagnostic data is not susceptible to operative or postmortem findings, as for example the degree of gastric acidity, the blood pressure, the degree of anemia or leucocytosis, gastric or intestinal peristalsis or motility, albuminurias, indicanuria, renal inefficiency, uremia, epilepsy, diabetes, paralyses, hyperthyroidism, etc. Other diagnoses are quite as certain before death as after autopsy, such as hernia, spinal curvature, spondylitic deformans, lacerations or displacements, pulmonary or renal tuberculosis, fistula, urinary infections or bacteriological demonstrations in general. The roentgen ray study may equal the autopsy in certain particulars, such as gastroenteroptosis, enlargement of the heart, the distribution of pulmonary deposits, the presence of fluids and air in the pleural sac, etc.; and it may excel the operative findings in some cases of cancer of the stomach, duodenal ulcer, diverticulæ, esophageal structure or obstruction at the cardia, etc. In conjunction with cystoscopic methods the roentgen ray leaves little about the renal tract for the surgeon to discover.

These lists are illustrative, not exhaustive. They help to show that the substantial accuracy of our statistics are dependent to a limited extent only on operative and postmortem findings, which nevertheless we greatly value. While the general conclusions of this paper would not be altered by any but large percentage errors, their truth is best established by cases taken as they come in the file without selection.

Our purpose is to classify the experiences which lead us to the conviction that in a large proportion of cases multiple pathologic processes do coexist and that an important factor of error does result from the failure to examine patients fully by combined methods of diagnosis.

NOTES ON THE ROENTGEN RAY WORK OF AN OVERSEAS HOSPITAL

BY CHARLES EASTMOND

Lieut. M. C., U. S. N. R. F.

BROOKLYN, N. Y.

MY roentgenological experience abroad was in connection with Navy Base Hospital Unit No. 1. This Unit went over under orders as the Base Hospital for the Marine Brigade, and the equipment taken was all of the Base Hospital type; that is to say, there was supplied an interrupterless transformer of standard type with horizontal and vertical fluoroscopes, a vertical plate changer and a standard type tube stand. We took our own sheet lead, darkroom fittings, tubes, etc., so our equipment was ample for any type of work which would be required. The electric current supply was such that it was readily adapted to the apparatus.

As there was no Marine Brigade at the time of our arrival in the first part of October, 1917, we were transferred to the Army, and consequently became an Army Base Hospital, and were stationed at Brest. As such, we recruited patients from the stevedore regiments working on the docks, and also from such detachments as were stationed in the neighborhood. The most important work, however, was as a Debarkation Hospital, as such receiving the sick from the transports.

So far as equipment was concerned, it was adequate. Shortage of mechanics in the enlisted personnel necessitated that the medical officer should be his own mechanic and the assembling of the apparatus, construction of aërials and general equipping fell under his direction.

Because of the location of the hospital and the character of the patients received, the work was primarily medical. Until the middle of April, 1918, when I was detached, no wounded had been received, and consequently no experience was gained with localization of foreign bodies or gunshot injuries. The work as a whole was that of a civilian hospital at home.

Occasional accidents with associated fractures or dislocations, an infrequent case of bone infection, with a few gastro-intestinal cases, comprised the minor part of the work, while the major part was associated with respiratory diseases and their complications.

Every pneumonia convalescent suspected of pleuritic complications was roentgen rayed. In this way a large number of cases of pleuritis were picked up in the earliest stages. Our experience with empyema during this period was, as has been the case in a majority of army hospitals on this side, that fully one-half of the cases are sacculated, and that cases of multiple sacculation were not uncommon.

The roentgen ray examination in these cases proved to be of the greatest assistance, especially in regard to determining the site of operation. A point of importance in this connection, and one that I believe has not been mentioned, is that in a case of sacculated empyema, especially of the more common type located along the outer margin of the chest wall, the dense shadow observed on the screen or plate marks the limit of *pleural* involvement, but is not an indication of the extent of the contained fluid. Our experience was that in this class of cases the fluid does not extend to the lower limit of the dense shadow, but that it ends at a point about one inch above it and that the lower part of the shadow is due to thickened pleura alone. This observation was confirmed many times at operation.

As the *x*-ray room was located next to the operating room, the rib resection or other surgical procedure was often carried out on the fluoroscopic table. Observation was here made that upon evacuation of the pus there is but slight change in the density of the affected area as viewed on the fluoroscopic screen, and that the shadow does not diminish to any degree for several days.

Another series of observations carried out in connection with the empyema cases was a study of the diaphragm on the affected side. It was the writer's observation that with the presence of fluid in the chest, the diaphragm movement on the affected side is practically abolished and that it does not return until there is a complete closure of the surgical thoracic opening. This, of course, applies to those cases in which lung expansion is free and there are no marked adhesions consequent to the infection. This practical abolition of diaphragmatic movement seemed to be present in the sacculated cases, as well as in the cases of free fluid. Location seemed to make but slight difference. In two cases of pus at the apex of the lung, the diaphragm movement was so diminished as to be indistinguishable on the screen. In one case, however, where pus was in the posterior mediastinum, no diaphragmatic alteration was observed.

In concluding these desultory remarks, the writer again wishes to emphasize: (1) that in operating in cases of empyema, the surgeon should make the incision at least one inch above the lower limit of the shadow in the sacculated cases, and (2) that diaphragm movement is practically abolished in the presence of fluid in the chest, even though it be sacculated, and that its function is not restored until there is a complete closure of the chest with full lung expansion on the affected side.

FAMILIAL DEFORMING CHONDRODYSPLASIA MULTIPLE EXOSTOSES*

BY C. S. GORSLINE, A.B., M.D.

BATTLE CREEK, MICHIGAN

IT has been my good fortune in the past year to have two groups of cases presenting certain skeletal deformities come to my laboratory for roentgenological study. These cases were so interesting and presented so many points in common, that I felt obliged to look up any literature which might throw light upon the subject. To my great regret I was unable to find any detailed report of cases of this type by an American roentgenologist. In fact the most able and authoritative article was published by a surgeon, Dr. Albert Ehrenfried of Boston, in the *Journal of the American Medical Association*, Feb. 17, 1917; and something will have been accomplished if the attention of roentgen ray specialists can be engaged along this line, so that more cases, well studied, are reported, thereby forming a broader basis upon which reliable deductions may be founded.

As to the literature hitherto published regarding skeletal deformities of this type, I can do no better than refer to the above mentioned article by Dr. Ehrenfried, as he has covered the ground very ably. I agree with him that what has been held to be a condition of rare occurrence is really more common than hitherto supposed. In the light of recent study, I realize that I have overlooked in my roentgenological practice many interesting groups of cases where the roentgenogram accidentally revealed abnormalities of bone structure, which would have yielded much interesting information if I had made diligent inquiry as to history and heredity. A. Render and P. Levy have an article in the *Lyon Chirurgical Journal*, August, 1914, on "Multiple Bony Exostoses with Arrest of Development and Deformity of the Skeleton"; also in May, 1917, D. M. Cowie gave a paper on "Hereditary Multiple Exostoses" before the American Pediatric Society; and the London *Lancet* for September, 1915, No. 4804, has an article by R. Cox entitled "Case of Multiple Exostoses with Hereditary History." No work on surgery to which I have access, gives more than a brief mention of the condition; but MacCallum's "Textbook of Pathology," page 882, under the subject of bone tumors, reads as follows:

"More difficult to interpret properly are the multiple exostoses which appear about the epiphysis in young persons and are left along the shaft as the bone grows. They are often partly cartilaginous for a time, but in the end are bony. They stretch for some distance and sometimes interarticulate, in a way, with one another, or by fusing limit the motion of the extremities. These growths are often observed to occur in one family, and seem to have a hereditary element."

As a preliminary contribution, I wish to report a series of four cases with such histories as were obtainable. These cases come from two familial groups.

CASE I, FIRST GROUP. MR. D. M.

(Figs. 1, 2 and 3.)

American born, probably of Scotch ancestry; age 67; height about five feet four inches; weight 127 pounds. His history is negative so far as disease is concerned and he was reared amid good surroundings with no history of rickets.

His mother first noticed his bony growths when he was four years old, and he said they continued to enlarge until he stopped developing at about 20 years. He always enjoyed good health and never had a fracture of any of his bones, notwithstanding the fact that he herded cattle two years in the West and spent most of his

* Thesis presented with application for membership in the American Roentgen Ray Society, 1918.

time on horseback. Later he became a manufacturer. He was very sensitive about his condition, and I discovered the abnormality while adjusting an armband preparatory to taking his blood pressure, which was 175 systolic. There was marked arteriosclerosis. It was for the symptoms of this condition that he consulted me, and he died of hemiplegia about one year later at the age of 68.

He had three sisters and five half-brothers, the latter children of his father's previous marriage. One sister and all of the half-brothers had abnormal bony growths, as did his father and paternal grandfather. Farther back than this he could not state.

FIG. 1.

He had the impression that those mentioned were affected mostly in the extremities.

He had two daughters, both married. One of these daughters has exostoses on the left femur, the left tibia and the right wrist, whether arising from the radius or ulna I cannot state. This daughter has two girls aged three and two, who so far have shown no evidence of the abnormality, according to the mother's report. The other daughter, who is normal, has one child less than a year old, who so far manifests no skeletal deformities. In Mr. D. M.'s case the deforming growths were large cauliflower masses chiefly affecting the long bones. I roentgenographed three of the more prominent of these growths.

FIG. 2.

Fig. 1 is of the right limb below the knee, the growth being on the inner aspect of the knee. In the single plate it appears as one mass, but stereoscopically it shows two

FIG. 3.

masses, one having its origin from the tibia and one from the fibula, but fusing when the development of the masses caused

impingement one upon the other. Other bony irregularities may be seen above and below the main masses. Fig. 2 shows a somewhat similar growth on the outer aspect of the right humerus. Fig. 3 is from the outside of the right femur. Another growth, which I did not ray, was present on the sternum. The patient told me he had never experienced the slightest discomfort from these tumors except from their size, but it could be plainly seen from his gait and posture that they interfered with the normal movements of the extremities.

These growths are cauliflower-like masses the size of an orange, having a definite stem or pedicle, and appear to arise from the cortex of the bone. The center of the bulbous portion is apparently as hard as ivory, while at the periphery it is less dense. They are not easily fractured because, though situated in an exposed position, only once in a lifetime was there ever a piece broken off, that being a small fragment of the growth from the right humerus, shown in Fig. 2. In the light of later study I am confident a more extensive examination would have revealed many more exostoses, as the forearms had the distortion peculiar to many of these cases. We have then a condition appearing in four successive generations, the fifth generation being still too young to be otherwise than negative.

CASE II, SECOND GROUP. MR. L. F.

(Figs. 4, 5, 6, 7, 8)

American born, of Irish ancestry; age 64; married; six children, three girls, M., aged 22, C., aged 20, and A., aged 18 years; and three boys, L., aged 16, E., aged 14, and R., aged 11 years. Three of these six children, C., A. and R., show skeletal abnormalities. The eldest of the girls, M., is married but has no children, so that inheritance through her is undecided. Two of the boys, L. and E., are reported to be negative, but have not been roentgenographed.

Mr. L. F., Case II, says he may have had rickets when a child, but I am of the opinion this is more a matter of suggestion than actual knowledge of his condition. He cannot remember that he was ever sick in his life. He is quite sure his mother was normal, but knows little about his father. He has only one sister, who so far as he knows is normal; but this sister's daughter, who is 20 years old, has bony abnormalities of the left leg below the knee and of the left wrist. Mr. L. F. has marked deformities of both forearms, due to distortion of the shafts of the bones, which are badly deformed, as well as to the exostoses at both ends as shown in Figs. 4 and 5.

The left radius (Fig. 4) is short, thick and curved outward. It is greatly enlarged at the distal end, which carries all of the articulation of the hand to the wrist, as the ulna is too short to enter into its usual relationship to the hand. This gives the hand a characteristic swing to the ulnar side. There is a small tubercle on the head of the radius. The left ulna is exceedingly heavy at its proximal end, the shaft is somewhat thicker and shorter than normal and has its only articulation at the distal end by a pronounced lateral union with the enlarged distal end of the radius. Furthermore, about 2½ inches from the distal end, there is a very sharp bend laterally toward the radius to such an extent that only when viewed stereoscopically can it be determined that it does not make another articulation or fusion with the radial shaft. No history of fracture is obtainable.

The right radius (Fig. 5) is somewhat longer and straighter, also heavier, than the left, with an even more pronounced enlargement of the distal end. Like the left, it carries all the carpal articulations giving the hand the same lateral swing. The right ulna is short, smaller than the left and fairly straight. It does not make the usual joint with the carpals, but is articulated to the side of the much enlarged distal end of the radius. What should be the styloid process is very broad and heavy. The proximal end is abnormally heavy,

though not so deformed as that of the left. The wrists and fingers are freely movable and reasonably strong.

The femur above each knee, as well as the tibia and fibula below (Fig. 6), all show outgrowths of bone, but not to the extent exhibited in Case I. These enlargements vary in shape from large blunt tubercles to sharp pointed, usually

FIG. 4.

curved spurs or spicules which invariably point away from the nearest joint, and do not present a surface deformity in proportion to the size of the growth beneath.

This case also has a large growth, which is about twice the size of an English walnut, arising from the posterior surface of the left ileum just below its crest; and on the posterior border of the left scapula there is a flattened growth about 2½ inches in diameter arising from the inner surface of the scapula, growing out from under it, and lying close down upon the ribs, as shown by stereoscopic roentgenograms. This scapular growth has a peculiar flaky appearance, as of minute particles of very dense bone in a more rarified stroma, which I have not found in any of the other exostoses. These two are the only instances in which flat bones are involved and they are of the cauliflower type, resembling those on the extremities of Case I. These conditions are poorly shown in Figs. 7 and 8.

CASE III, MISS A. F., EIGHTEEN-YEAR-OLD DAUGHTER OF CASE II.

(Figs. 9, 10 and 11.)

The forearms (Fig. 9) present some of the deformities found in the father, but not so marked. The right radius and ulna are not shortened, but are thickened and rather more curved than normal, and the ulna, being short, articulates with the

FIG. 5.

radius only. It has no styloid process. Exostoses appear on the second phalanx of the right middle finger.

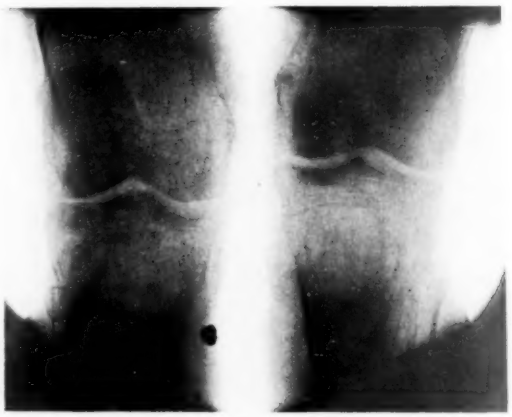

FIG. 6.

The left radius has a greatly enlarged distal end which articulates laterally with the ulna, but the ulna is long enough to assume its proper relation with the carpal bones. Slight exostoses are seen on some

of the phalanges of the left hand. The condition above and below the knee joints (Fig. 10) is more exaggerated than in Case II. The right tibia just above the ankle is greatly deformed by an enormous nodular growth on the anterior surface and a smaller one posteriorly, which again is of the cauliflower type. As this prohibits the lacing of the shoe, I hope it will be removed in the near future. The lower end of the right fibula also shows a posterior spur.

CASE IV, R. F., ELEVEN-YEAR-OLD SON OF CASE II.

(Figs. 12 and 13.)

Here the deformity of the wrists is still less marked, but the tendency to spur formation is more emphatic, and there is a considerable outward bend in the right radius with sharp curved spurs, one on each lateral aspect of the bone. The ulna is straight, but shorter than normal, with a tendency to articulate with the radius more than with the carpals. The epiphyses of both bones are distinct and somewhat wedge-shaped. The left ulna is fairly normal as to shape, length and epiphysis, but the left radius is bent outward and has a sharp spur on its lateral aspect. Certain of the phalanges and metacarpals of the left hand show beginning exostoses. Both knees show even at this early age very pronounced exostoses, of the nodular and long spur types, together with great thickening of the heads of the fibulæ. These appear to fuse with the heads of the tibiæ. Each fibula, however, has a distinct epiphysis at the upper end. None of the epiphyses entering the knee joint formation are abnormal. If these exostoses continue to grow according to their early promise there will be great deformity of these joints before development ceases.

FIG. 7.

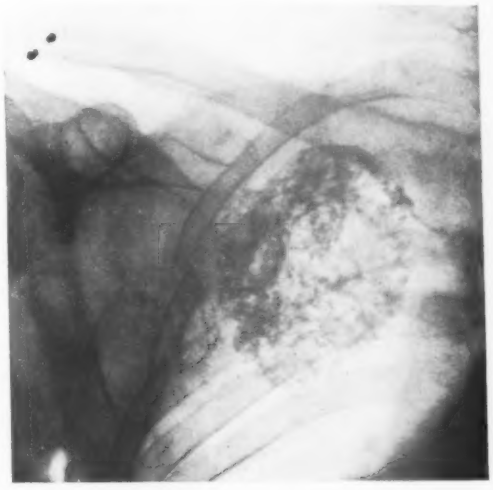

FIG. 8.

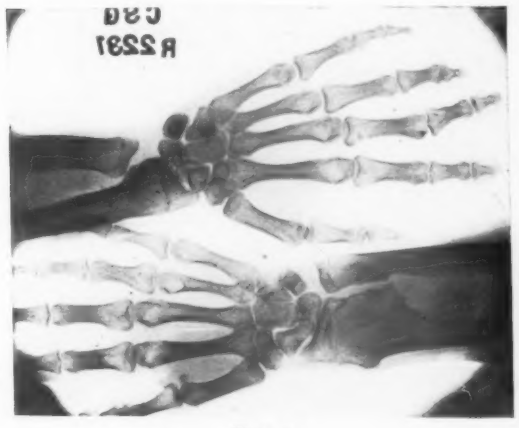

FIG. 9.

SUMMARY

Certain manifestations seem to be fairly constant in the four cases of which prints

of the roentgenograms are here shown, and of the associated cases of which I have reasonably authentic accounts.

1. In all four cases studied there is a marked common postural characteristic. The elbows are carried out from the body, the hands turned toward the ulnar aspect of the forearm and the knees bent inward and slightly flexed, so that the patient is decidedly knock-kneed, especially in Cases I and II, who were advanced in years.

FIG. 10

FIG. 12.

FIG. 11.

FIG. 13.

This was so marked in Case I as greatly to interfere with his walking. The head is carried slightly forward.

2. The fingers in all four cases were inclined to be short for the width of the hand, but were capable of complete flexion and extension. They were not clubbed.

3. The long bones are most often affected, especially the femur, tibia, fibula, humerus, radius and ulna.

4. There appear to be three general types of exostosis; spurs, tubercles, and pediculated, cauliflower-like masses. When spurs occur, they are invariably pointed away from the nearest joint. I cannot say whether or not this is due to the natural strain of muscle and tendon attachment.

5. The regions usually affected are the

elbows, knees and wrists; all joints of great activity.

6. None of these growths are painful unless subjected to traumatism; nor are they especially liable to fracture, their size and location causing the only inconvenience suffered.

7. They begin to develop at an early age and are progressive so long as bone growth continues; none of them has receded so far as I know.

8. I was unable to detect any abnormality of the epiphysis of any bone in any of the four cases of which roentgenograms were made.

9. There is a marked hereditary or at least familial tendency.

10. Bilateral symmetry as to position is the rule; but usually one side is more affected than the other.

From a practical standpoint it should be borne in mind that endostoses occur as well as exostoses. In 1917, Ochsner and Rothstein reported a case of multiple exostosis in which an intraspinal, pediculated endostosis on the anterior aspect of the right lamina of the second cervical vertebra, pressing upon the cord, caused incoordination of upper and lower extremities; operation improved the condition. Also in the same year Clark and Atwood reported "a case of multiple enchondroma, one of which is growing from the sella turcica, causing pressure on the pituitary body," which evidently produced spastic quadriplegia. Undoubtedly, in many cases where exostoses have been so located as to cause pain in joint movement, a diagnosis of articular rheumatism has been made. It therefore seems that in any case where exostoses are detected and symptoms of nerve pressure, arthritis, etc., are present, careful, intensive roentgenography should be thoroughly carried out.

My study of this subject in the four cases shown, and a review of the literature, especially the article by Ehrenfried, which comprises a study of about 600 cases, lead me to agree with him that we have in this condition a definite pathological entity that is by no means rare, and which may give rise to certain very serious consequences; that the condition appears to be hereditary, and is most often present in the extremities. The exact etiology has not as yet been settled; therefore it is highly desirable that every case coming to the attention of roentgenologists, as well as of surgeons and clinicians, should be thoroughly studied and reported, with the hope that the causative factors may, if possible, be determined.

HYDATID DISEASE OF BONE

BY HERSCHELL HARRIS, M.B., CH.M.

SYDNEY, NEW SOUTH WALES, AUSTRALIA

THIS disease is always difficult to diagnose radiographically, as the appearances are so similar to an osteomyelitis. In the present case when seen eighteen months previously, and on careful comparison with the opposite tibia, a faint difference was noticed in so far as the affected tibia presented an area of very slight absorption.

The symptoms were not very marked at the time and the patient complained mainly of a slight pain below the knee. An inflammatory lesion was diagnosed. Various methods of treatment were adopted, but all without avail.

When next she presented herself some fifteen months later for another radiographic examination, the appearance as shown in the accompanying plate was present. The area of absorpton had greatly increased, and was quite well defined. Also a small loose piece of bone was seen lying alongside of the tibia. Meanwhile the symptoms had increased and the pain

FIG. 1.

was more severe, and some swelling was present.

A diagnosis was then made of tubercular osteomyelitis.

An operation was performed and hydatid of the bone was found, involving the medulla of the upper third of the tibia. The diseased tissue was curetted away, the cavity was packed, and a good recovery ensued. The case is worth recording, as hydatid disease of bone is not common. During my twenty years experience with the roentgen rays, it is the fifth case I have encountered. One involved the lumbar vertebræ, and was diagnosed as caries of the spine. Later on an operation revealed the condition. The other four cases involved the humerus and femur, and a spontaneous fracture occurred in each case. Union did not take place and it was a subsequent operation which disclosed the condition.

When hydatid occurs in bones, usually the medulla is involved and the growth is fairly rapid, and eventually the whole medulla becomes involved. Early operation offers the best prospect of success, and consequently an early diagnosis should be arrived at in these cases. I am afraid that this will not often be made, but still if we can diagnose osteomyelitis it will probably be the means of an operation being performed and the condition then being revealed.

PEDUNCULATED MALIGNANT GROWTHS OF THE STOMACH

BY DR. GEORGE W. HOLMES

BOSTON, MASS.

THE object of this paper is to call attention to a fluoroscopic sign which is fairly constant and of considerable value in the diagnosis of pedunculated tumors of the stomach, and to place on record two cases which seem to me to be of considerable interest.

Polypoid tumors of the stomach, either benign or malignant, are relatively rare. Alfred Tigler, in thirty-five hundred autopsies, found but fourteen benign tumors of the stomach. Versé, out of fifty-five cases of polyp of the digestive tract, found only four which were in the stomach. Ebstein, in 1864, in six hundred autopsies found fourteen cases of stomach polyps and collected reports of eight others from still earlier writers. Myer, in 1913, reported a case in which the diagnosis made prior to operation or necropsy, was based on peculiar sounds and palpation sensations and on studies made of a piece of the tumor found in the stomach washings. In the fluoroscopic and roentgenographic examinations made by Carman there were absence of filling of the anterior end of the stomach and almost total obliteration of the pylorica. The barium mixture passed through this portion of the stomach in such a way that it suggested the outline of a mass. There was no evidence of gastric stasis and no report of the appearance of the peristaltic wave. Basch reports three cases with a complete description of the roentgen ray findings,—all three showed large circular filling defects. He noted that there were hyperistalsis and hypermotility, but does not state whether there was a break in the peristaltic wave when it passed over the site of the tumor.

The cases which I wish to report were studied roentgenologically by me at the Massachusetts General Hospital and were operated upon by Dr. C. A. Porter.

The first (H. M.), a man of forty-eight years, was seen in 1913. A brief outline of the history follows:

Eructations of gas with occasional vomiting for twenty-eight years; no pain; no signs of blood. Three months previous to admission he developed a sensation of oppression in the epigastrium, with increased eructations and vomiting, vomitus containing food taken two days previously. The oppression was relieved by dieting. In the physical examination it was noted that there was loss of weight but no anemia. The chest showed dullness at the right apex which was confirmed by roentgen ray examination and thought to be tuberculosis. The Wassermann test was negative. Examination of the stomach contents: 65 c.c. free HCl 0. Guaiac positive. No sediment. Test meal: 220 c.c. Free HCl 0.29 per cent. Total acidity 0.12 per cent.

A medical consultant at this time stated that there was a soft gland palpable above the left clavicle, and that in the examination of the abdomen a mass could be felt in the region of the pylorus.

Roentgen ray examination of the gastrointestinal tract showed a large, low stomach with sluggish peristaltic waves which passed entirely over both curvatures. The pyloric sphincter and duodenal cap were not made out. The emptying time was not recorded.

The conclusions were that there was a pathological process at the pylorus and that this process was probably ulcer.

At operation, a rather large tumor was seen and felt at the pylorus, it seemed to be movable. The stomach was opened and a soft lobulated tumor, the size of a small lemon, was seen lying in the pylorus and duodenum. Another similar but smaller tumor was seen on the greater curvature of

the stomach. There was no evidence of ulceration and no glands; the mass was movable and resection seemed possible, but in the opinion of the operator, gastroenterostomy followed by a second operation offered the best chance to the patient.

The opinion of the pathologist at the time of the operation was that the tumor was a sarcoma of the stomach and duodenum.

Four weeks after the first operation a second was performed. The tumor had not changed in size and was lying in the pylorus on the duodenal side of the pyloric vein, prolonged backward to the left and to the greater curvature of the stomach. The anterior wall of the duodenum and pylorus moved over it as if it were a polyp. There was no infiltration of the walls demonstrated. The anterior portion of the stomach and the duodenum were resected.

The patient was in rather poor condition following the operation but made an uneventful recovery and was discharged from the hospital relieved.

The pathological note on examination of the specimen is as follows:

> Portion of the stomach and duodenum: Section shows the pyloric opening filled with a plum-sized tumor mass adherent to the greater curvature, surface ulcerated, reddened, section smooth and attached to the mucosa by a broad base. A few soft lymph nodes. Microscopical examination showed a very cellular growth with fibrous tissue and occasional very large cells. It is covered by a little thin mucous membrane. At the base there is an infiltration of the growth between the bundles of muscular tissue. Diagnosis: Fibrosarcoma.

After examination of the lungs by a medical consultant at the time of discharge, a diagnosis was made of fibroid phthisis of the upper lobe of the right lung with infiltration of the left apex.

In a letter received from the patient on April 20, 1919, six years after the operation, he states that he has been entirely free from symptoms; is well, strong, and going about his work in the usual manner.

The second case (B. J. P.), is that of a man aged forty-seven. The only note of interest in the past and family history is that he had glands in the neck when six years old which a doctor called "scrofula." For a period of more than a year, the patient has had attacks of pain around the navel, radiating to a corresponding point in the back, at times followed by vomiting. He vomited blood several times. There was a gradual loss of weight (in all, 32 pounds), so that he was unable to attend to his work. The pain, which was sharp and severe, was apt to occur in the morning before breakfast; he was not disturbed at night; and though almost immediately relieved by taking food, it persisted for an hour or more when food was not taken. The pain was also relieved by soda and by vomiting. Eleven months ago, in an attack of vomiting he noticed what he thought to be a clot of blood, about the size of a walnut, in the vomitus. At that time he was admitted to the Massachusetts General Hospital and remained ten days, during which time there was no vomiting attack. While in the hospital, however, he had some acute infection with râles in the lungs, and rise of temperature to 104.6°. This lasted about four days and cleared up.

Roentgen ray examination of the stomach made at this time showed a low, large stomach, normal in outline and peristalsis; the peristaltic wave passed completely over both curvatures. There was a small residue at the end of six hours, and a large filling defect of the media resembling a gas bubble which was movable, but which was present in all positions on different days. The examination of the colon was not remarkable. The conclusions from the roentgen ray examination were that the findings were probably due to a polypoid tumor in the mid-portion of the stomach.

About a week previous to the present entry, the patient vomited half a cupful of chocolate colored fluid. He was very weak, and incapable of any exertion.

The physical examination showed evidence of emaciation and pallor; the radial arteries were palpable and tortuous; an indistinct mass was felt in the abdomen, otherwise nothing of importance noted. The urine was negative; hemoglobin 40 per cent. The Wassermann was negative. An examination of the stool showed the presence of blood. A test meal resulted in 70 c.c. of clear fluid, no free HCl; total acidity 10 c.c. n/10 NaOH = 0.04. Microscopic examination showed starch granules, no sarcinæ, guaiac test being faintly positive.

FIG. 1. THIS PLATE WAS MADE WHEN THE STOMACH WAS NEARLY EMPTIED AND AFTER A RATHER PROLONGED FLUOROSCOPIC EXAMINATION. FOR THIS REASON IT IS RATHER UNSATISFACTORY. IN THE MIDDLE OF THE STOMACH SHADOW, HOWEVER, CAN BE MADE OUT THE MOTTLING DUE TO THE PRESENCE OF THE POLYPI.

Roentgen ray examination at this time showed a marked increase in the size of the mottled area (noted at the previous examination) which now filled the greater part of the mid-portion of the stomach and presented an appearance more like that of extensive carcinoma. The stomach was dilated and atonic, and peristalsis was absent during the entire examination. The stomach was empty at the end of six hours. Without the previous roentgen ray findings, it would have been impossible to make a definite diagnosis at this time.

At operation, on opening the abdomen the mesentery was found to be edematous, there was free fluid in the pelvis; the stomach was dilated. There was no evidence of cancer in the wall, but it was very clear that it contained two large polypoid masses the bases of which could not be made out. The stomach was opened, and definite groups of polypi, the largest the size of a lemon, were seen. Clamps were applied and the polyps removed; the veins sutured, and the stomach closed.

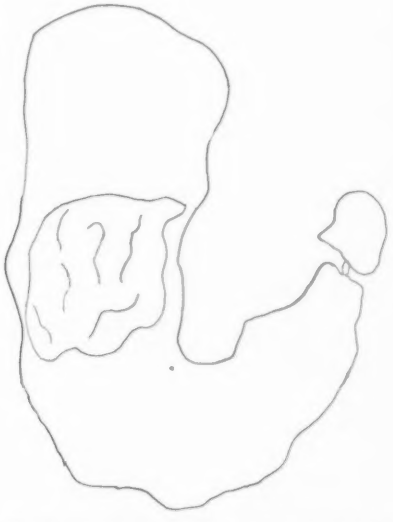

FIG. 2. THIS TRACING GIVES A FAIRLY GOOD IDEA OF THE POSITION AND SIZE OF THE TUMOR IN RELATION TO THE STOMACH. IT ALSO SHOWS THE ABSENCE OF A BREAK IN THE OUTLINE OR PERISTALSIS.

The pathological report reads:

> Two soft round or oval tumors, one the size of a hen's egg, the other a little smaller. They have a narrow surface and on section show a moist, reddish gray crater, with a white central core. Microscopical examination shows the

NOTE.—Figs. 2–3–4 represent tracings made at the fluoroscopic observations.

mucosa infiltrated with a richly cellular tumor which for the most part shows no definite structure at the periphery. There are irregular spaces which contain serum and blood cells and are lined by cells similar to those of the tumor. In these spaces the cells spring from the wall in an elevated rounded form and have large rounded or oval nuclei. Diagnosis: Lymphangio-endothelioma.

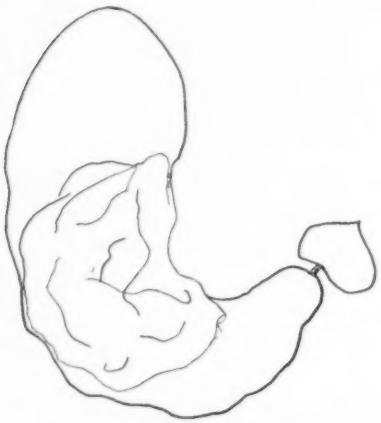

FIG. 3. THIS TRACING WAS MADE ELEVEN MONTHS AFTER FIG. 2, AND SHOWS THE INCREASE IN SIZE OF THE TUMOR DURING THIS PERIOD.

The patient made an uneventful recovery from operation. A month later, at the time of his discharge, the roentgen ray examination showed no evidence of recurrence of the mass in the stomach. The mid-portion was somewhat contracted and the rugæ were visible. There was no stasis and no irregularity in peristalsis.

SUMMARY

Both of these cases had definite pedunculated tumors. In general, tumors of this kind are not malignant. In both cases the peristaltic waves passed over the involved area of the stomach without evidence of break, such as is seen in lesions which involve the gastric wall.

When the gross pathology of these growths is considered, there is no reason to expect that the wave would be obstructed. The appearance of the shadow of the bismuth-filled stomach in a case with polyp is most suggestive of the pictures seen when there are large masses of food present, or of advanced carcinoma.

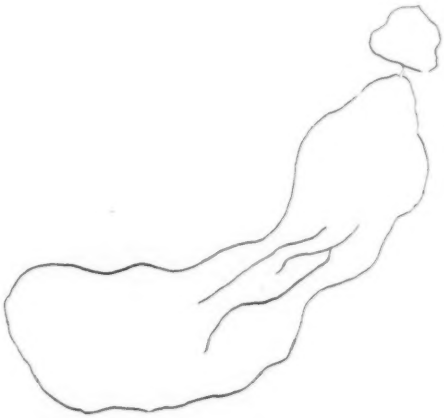

FIG. 4. ILLUSTRATES THE SIZE AND SHAPE OF THE STOMACH AFTER THE TUMOR HAD BEEN REMOVED.

There are two cases, one reported by Myer and another referred to by him, in which the diagnosis was made previous to operation or autopsy. In both cases the diagnosis was made after microscopical studies of pieces of the tumor in the stomach washings. So far as I know, Case 2 of this report is the first case in which a diagnosis of gastric polyp was made on the roentgen ray findings.

FIG. 5. FROM BASCH'S ARTICLE ON "PRIMARY BENIGN GROWTHS OF THE STOMACH." IT ILLUSTRATES VERY PRETTILY THE PERISTALTIC WAVES PASSING OVER THE AFFECTED AREA.

It is of interest to note that in both of these cases the Wassermann was negative, as the question of a syphilitic origin of benign tumors of the stomach has been raised.

The literature on fibrosarcoma of the stomach is very scanty. The only author I have been able to find who discussed it at all completely was Fenwick. More recent writers and the pathologists whom I consulted consider it extremely rare and very little is known about its course.

The fact that the patient in the case first mentioned in this report is entirely well at the present time might lead one to doubt the accuracy of the diagnosis. The pathological report which is quoted was made by Dr. Whitney of the Harvard Medical School, and a recent discussion with the pathologist of the department confirms his observations.

The differential diagnosis in these cases from the point of view of the roentgenologist is from foreign bodies (including food) in the stomach and large carcinomata. Food can be ruled out by repeated examinations. Gastric cancer, which displaces the barium shadow in a way simulating polypi, as a rule involves the wall of the stomach sufficiently to prevent the free passage of the peristaltic wave.

BIBLIOGRAPHY

1. Campbell, A. M.: Benign Tumors of the Stomach. *Surg., Gynec. and Obstet.*, 1915, XX, 66–71.
2. Wade, H.: Intussusception of the Stomach and Duodenum due to a Gastric Polypus. *Surg., Gynec. and Obstet.*, 1913, XVII, 184–190.
3. Basch, S.: Primary Benign Growths of the Stomach. *Surg., Gynec. and Obstet.*, 1916, XXII, 165–70.
4. Myer, J. S.: Polyposis Gastrica (Polyadenoma). *Jour. A. M. A.*, 1913, LXI, 1960–1965.
5. Carman and Miller: Roentgen Diagnosis of Diseases of the Alimentary Canal.
6. Tilger, A.: Ueber primäres Magen sarcom. *Arch. f. path. Anat.*, v. 133, p. 183.
7. Versé, M. A.: Ueber die Entstehung, den Bau und das Wachstum der Polypen Adenome und Karzinome des Magen-Darmkanak.

CHEST ROENTGENOLOGY IN THE SELECTIVE SERVICE EXAMINATIONS

BY W. WARNER WATKINS, M.D.

PHOENIX, ARIZ.

EARLY in the examinations under the Selective Service Act, Cole insisted on the value and practicability of roentgenology in detecting tuberculosis in the drafted men, making a practical demonstration of his claims. Partly on account of the unwillingness of the examining boards to admit the value of this method of detecting tuberculosis, but chiefly because most of the trained roentgenologists of the country promptly entered army service, it was found impossible to make general use of roentgenology in routine draft examinations before the men were taken to the mobilization camps. In the examination of the soldiers at these camps, the value of fluoroscopic and roentgenographic examinations in suspected chest diseases has been abundantly demonstrated. It may be of interest to report a series of cases examined in ordinary draft work.

Medical Advisory Board No. 2 of Phoenix, Ariz., asked its roentgenologist (the writer) to make roentgen ray examinations of all heart and lung cases, which was done. The vast majority of the examinations were fluoroscopic, plates being made in less than one-third of the lung cases. It was found perfectly feasible, under our arrangements, for the roentgenologist, with one assistant, to examine the registrants with the screen and make plates, when necessary, as rapidly as four chest examiners could make the physical examinations. The greater facility of the fluoroscopic examination was immediately apparent, and it became simply a question

of accuracy, if the methods were to be compared.

Our routine was to fluoroscope the heart, making a diagram outline of it, with measurements marked and notation of any abnormal pulsations. The lung shadows were recorded and kept as a separate record until the physical examinations had been made; the roentgenologist then compared the two and if they disagreed in essentials, a roentgenogram was made. The physical findings and roentgen ray findings would then be presented to the Board, which would decide upon the disposition of the registrant.

The results of the physical and roentgen ray findings on 1140 men examined by the Board for chest disease is given in the accompanying table.

RESULTS OF PHYSICAL AND X-RAY EXAMINATIONS OF 1140 DRAFT MEN

Qualified by the Board as to Chest Condition	462
Normal by physical examination and normal by *x*-ray examination	316
Normal by physical examination and slightly abnormal by *x*-ray examination	90
Slightly agnormal by both examinations	39
Slightly abnormal by physical examination, and normal by *x*-ray examination	17
Disqualified by the Board as to Chest Condition	678
Disqualified by either examination	264
Normal by physical examination and disqualified by *x*-ray examination	148
Abnormal by physical examination, (see note) and disqualified by *x*-ray examination	225
Abnormal by both examinations and disqualified by correlating the two	41

(NOTE: Of the 225 found abnormal by physical examination, 117 had such trivial abnormalities that they should have been classed as normal, according to the instructions of Form 75.)

Discussion:—There were then 462 men, or 40 per cent of the group examined, whose lungs were found to be practically free from disease. This is important because, in spite of the fact that the majority of these were referred to us on account of suspicious chests, the roentgenologist passed them as practically normal, refuting the frequent charge that he will find abnormal shadows in all chests. This series demonstrates that he is no more likely to make wrong interpretations of what he sees than the clinician is of what he hears with the stethoscope.

On the other hand, there were 265 cases, or *twenty-four per cent of the number examined*, who would have been qualified on their physical findings and sent to the mobilization camps had they not been examined by the roentgenologist. About five years ago, the writer gave as his estimate, that one case in five of pulmonary tuberculosis would have lesions of such a character or so located that the average chest examiner would detect no variation from the normal in physical signs. This estimate is closely approximated by this twenty-four per cent whose lesions escaped detection by the auditory and tactile methods of physical examination. This twenty-four per cent does not include the men whose physical findings suggested tuberculosis and who were sent to the roentgenologist marked "suspicious." There were 108 of these who, as soon as suspicious signs were found, were sent forthwith to the roentgenologist as a more expeditious method of disposing of the registrant.

A relatively small group of eighty cases are important in that their physical findings and roentgen ray findings were both abnormal, but neither sufficiently so to warrant definite diagnosis of tuberculosis; and conferences between clinicians and roentgenologist, frequently with re-examinations of the registrant, were necessary to arrive at conclusions. Thirty-nine of this group were qualified and forty-one disqualified. This group illustrates the fact, often overlooked, that the usual procedure in utilizing the roentgen ray in lung examination is wrong. The roentgen ray should be used as a part of the physical examination, with the idea of visualizing patholog-

ical changes through the eye, just as the stethoscope is used to visualize them through the ear, or the fingers through the tactile sense. Instead of regarding the clinical and the roentgen as different, and often antagonistic, methods of examination, we should look upon the roentgen ray as the addition, simply, of another leg to the old tripod upon which physical examination has heretofore rested.

It is evident, in this series of cases, that, so far as the detection of the bare presence of tuberculosis of the lungs is concerned, the roentgen ray would have been sufficient in itself, because every case diagnosed by physical examination was readily detected by the roentgenologist. On the other hand physical examination alone would not have been sufficient, since it failed to detect undeniable tuberculosis in twenty-four per cent of the men examined. However, in the detection of activity in any given area in the lung, the roentgen ray must yield to physical examination. Col. Bushnell's criteria for roentgen ray shadows which must be considered disqualifying, as laid down in Forms 64 and 75, were followed as closely as adherence to recognized roentgenographic pathology would permit. No case was rejected on roentgen ray shadows unless they were at least as marked as those described by him, and many were qualified when the basal shadows mentioned in Forms 64 and 75 were present, but when in the opinion of the roentgenologist they did not indicate tuberculosis. No registrant was disqualified on shadows limited to the neighborhood of the hilum.

CONCLUSIONS

In the examination of 1140 drafted men for chest disease, in no instance did the physical examination detect tuberculosis which was not also readily shown by roentgen ray.

In twenty-four per cent of 1140 men examined, the physical examination failed to detect a disqualifying chest disease which was demonstrated by the roentgen ray.

In detecting the bare presence of tuberculosis or other disqualifying chest disease, the roentgen ray would be sufficient in itself; but to determine the presence of activity, physical examination is necessary.

In any thorough physical examination of the heart or lungs, the roentgen ray should be employed, unless the examiner is willing to accept the risk of twenty per cent error.

PROSTATIC CALCULI FROM THE ROENTGEN RAY DIAGNOSTIC STANDPOINT *

BY MAXIMILIAN J. HUBENY

Consulting Roentgenologist Chicago Municipal Tuberculosis Sanitarium, Henrotin Memorial Hospital, Chicago Polyclinic Postgraduate School, Grant Hospital

CHICAGO, ILL.

PROSTATIC calculi occur much more frequently than is suspected. In 1914, Gläsel[1] in the German literature collected fifty-four cases. Recently Kretschmer[2] has extended this to 173 up to the end of 1917. The earliest citation on this subject is one by Marcellus Donatus[3] as far back as 1586.

Prostatic calculi are classed as true or false. They are also known as primary, autochthonous or endogenous; and secondary, metastatic or exogenous. The true or primary calculi originate in the parenchyma of the gland from deposition of phosphates, etc., around some degenerated tissue nucleus; the secondary stone reaches the prostate from the kidney, bladder, etc. Many of these secondary stones are not really prostatic but belong to the prostatic urethra. True prostatic calculi in composition consist of more than 80 per cent phosphate of lime, and may thus to a large extent be differentiated from secondary calculi.

Although the diagnosis of prostatic calculi can in every case be definitely established by means of the roentgen ray, it is surprising how limited has been the application of this diagnostic method. Forssell[4] in 1909, reporting on the roentgenologic diagnosis of prostatic calculi, was able to find in literature only four cases in which a roentgen examination was made. Since then cases have been reported by Cholzoff,[5] Cochez, Brickner,[15] Moucharinsky,[6] Naumann,[7] Ravasini,[8] Thompson,[9] Voelcker,[10] Pasteau,[11] and Daubert and Beaujeu.[12]

Forssell[4] was the first to make a thorough study of the value of the roentgen ray in prostatic calculus diagnosis. He made roentgenograms of eleven cadavers and then dissected out the gland. He found two cases with prostatic stones. He also examined 100 living subjects. In thirteen of the 100 subjects examined, he found prostatic calculi. The calculi were of two types. In the first type the shadows of the stones appeared as small, round, discrete dots, varying in size from that of a pinhead to a hemp-seed, and arranged symmetrically on each side of the mid-line just above the symphysis. This type of calculus appeared to be a normal result of senility. Between the ages of twenty and fifty years it only occurred in 5 per cent of the cases; from fifty to ninety-three years it occurred in 20 per cent. The second type of calculus occurred as good-sized patches made up of conglomerations of the small ones. They show higher up in the pelvis from 1.5 to 3 cms. above symphysis. This type does not seem so definitely a senile condition, as it apparently occurs in middle life from pathological changes. Forssell thinks that the arrangement, form and density of prostatic calculi are very characteristic, and that differentiation from other pelvic concretions is possible; also that they can be distinguished by careful roentgen ray examination. Kretschmer[2] thinks that the symmetrical arrangement referred to may change as time elapses; and that the grouping of the shadows is by no means constant. Kretschmer gives roentgenograms of eight cases examined by him. Forssell also gives two plates. From these plates it appears evident that there is much diversity in the arrangement of the stone shadows.

The necessity for careful and repeated

* Read before the Western Section of the American Roentgen Ray Society, March 22, 1919.

examinations and for intensification of plates is evidenced by some cases in which earlier roentgen ray examinations failed. Thus Daubert and Beaujeu[12] reported a case in which the symptoms suggested vesical calculi. No stones could be found on exploration, and a roentgenologic examination was negative. A second radiologic examination was made in a different position, and with bismuth solution in the bladder showed shadows exterior to the bladder. Operation confirmed the roentgenologic diagnosis, stones being found in the prostate. Pasteau[11] similarly found that in a patient who had been considered a case of vesical calculus, the calculi were in the prostate, and that on dilating the canal the stones were expressed without need for further operation.

That routine roentgen ray examination of the prostate, in cases where it is indicated, is far from being current practice is indicated in recent reports on prostatic calculi. Townsend[13] reporting a case says: "From conversation with several *x*-ray men I have learned that occasionally prostatic calculi are discovered; but as far as they know it is not a routine practice among genito-urinary men." Peterkin[14] having made several examinations in a manifest bladder calculous case examined by the roentgen ray states: "The *x*-ray is essential as a means of obtaining direct and corroborative evidence of pathological conditions of the bladder. In this case the *x*-ray gives direct evidence, the cystoscope negative evidence." In this case of Peterkin, infection and urinary deposits completely replaced a normal prostate and substituted one of stony formation. The condition was revealed by the plates.

Kretschmer says that the routine employment of the roentgen ray for the demonstration of stone in all obscure cases should be strongly urged, especially in cases of so-called chronic prostatitis which do not respond to the usual forms of treatment.

In the plate the shadows of prostatic calculi usually show behind the symphysis pubis.

Kretschmer also states that the routine use of the roentgen ray after operation for removal of calculi should always be carried out so that the operator may be assured that all stones have been removed. Examination of the literature shows that such a precaution is usually neglected.

Brickner[15] in 1913 in reporting on the diagnosis of prostatic calculi, stated two propositions:

(1) If a roentgenogram of the unemptied bladder, exposed with the patient in the level supine or reversed Trendelenburg position, shows a shadow or group of shadows in the region of the neck of the bladder; and a second roentgenogram, exposed with the patient in the Trendelenburg position, and the roentgen rays passing in the same relative direction, shows the shadows in the same place as before; the stone or stones are fixed in the prostate, or the prostatic urethra, or in a diverticulum behind the prostate.

(2) The absence for a long period of time of all signs of local infection in a case of purulent prostatitis, is strongly suggestive of a calculus etiology.

Brickner illustrates two cases of prostatic calculus with two roentgenograms, both in patients over sixty years of age.

The points established in the literature appear to be:

1. That prostatic calculi occur much more frequently than is thought.

2. The condition is often confounded with chronic prostatitis, etc.

3. That stones in the prostate can certainly be diagnosed by the roentgen ray.

4. That the demonstration of stones by the roentgen ray will often obviate the operative opening of the abdomen and bladder, as in many cases the stones can be expressed through the urethra.

CASE REPORT.—Referred by Dr. Walter Venn. Male, aged fifty-seven, excellent physical condition. Had measles during childhood; pneumonia at fifteen years of

age; typhoid at thirty-five, and gonorrhœa at twenty years of age.

Present Complaint.—Frequency of urination began about two years ago. Recently he has had occasional attacks of inability to urinate with burning on urination, both before and after the act. A constant desire to urinate was not present. The frequency had gradually increased until at the present time it is six or seven times during the day and two or three times at night. He passes but a small quantity of urine at a time. About two months ago, following a fall, he was unable to urinate from two o'clock in the afternoon until late at night. A catheter was used at that time, but not since.

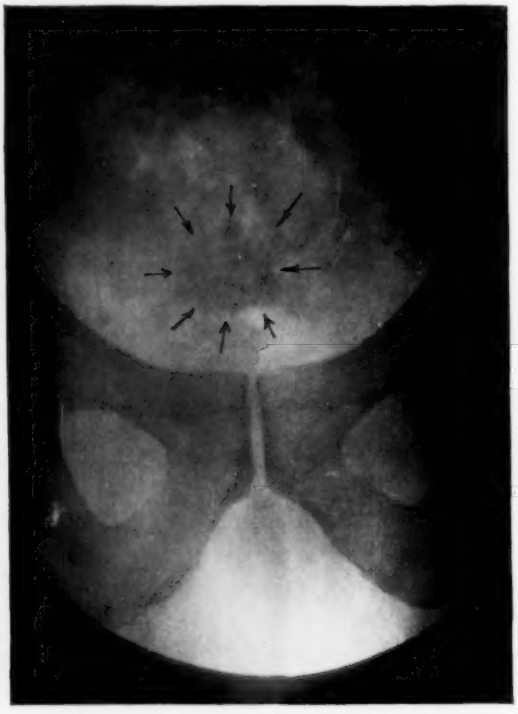

FIG. 1. MULTIPLE CALCULI. FIFTY-FOUR ARE DEMONSTRATED ON THE PLATE.

Examination showed the external genitals negative. Reflexes were good. Prostate was greatly enlarged, smooth, regular and even, with no nodules or tender areas. Seminal vesicles were not palpable.

Blood examination showed 7500 leucocytes and 58 per cent hemoglobin. Blood pressure was 128 systolic and 68 diastolic. Urine was bloody with a specific gravity of 1020. There were few epithelial cells, many red blood cells, a few leucocytes, and no bacteria. Culture of the urine was negative.

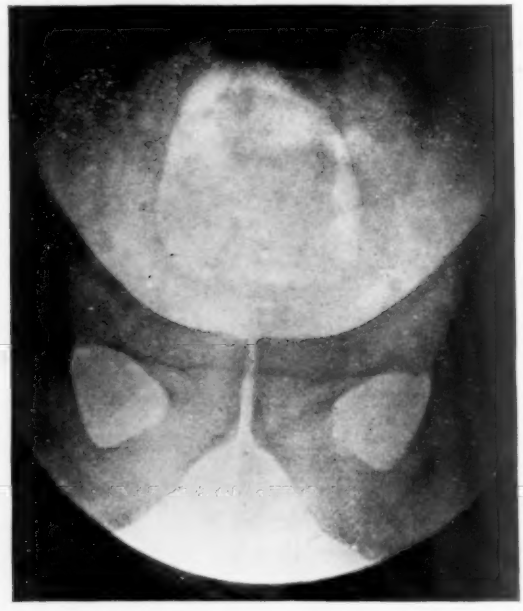

FIG. 2. SAME CASE AS SHOWN IN FIG. 1, WITH COMPLETE DISAPPEARANCE OF SHADOWS AFTER EVACUATION FOLLOWING PROSTATIC MASSAGE.

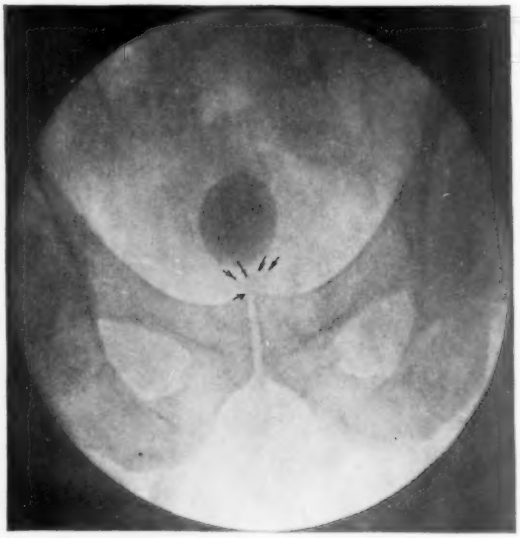

FIG. 3. MULTIPLE PROSTATIC CALCULI AND VESICAL CALCULUS PRESENT IN SAME PATIENT.

The roentgenogram showed the presence of many calculi (fifty-four could be counted on the plate) situated medially and suprapubically, corresponding to the usual location of prostatic stones. Chemical analysis by Dr. R. W. Webster showed the predominance of calcium phosphates. A roentgenogram of a few of the calculi which were expressed after prostatic massage showed that a fusion of several smaller calculi had taken place.

BIBLIOGRAPHY

1. GLÄSEL: Calculi Prostatici Veri. *Zeitschr. F. urol. Chir.*, 1914, II, 353.
2. KRETSCHMER: True Prostatic Calculi. *Surg., Gyne. and Obstet.*, Chicago, 1918, XXVI, p. 70.
3. MARCELLUS DONATUS: De re Med. Historia. 1586, Chap. XXX.
4. FORSSELL: Ueber die Röntgenologie der endogenen Prostata konkremente. *Muench. Med. Wchn.*, 1909, LVI, 1176.
5. CHOLZOFF: Ein Fall von multiplen Steinen der hypertrophierten Prostate. *Zeitschr. f. Urol.*, 1909, III, 423.
6. MOURCHARINSKY: *Rev. clin. d'urol.*, 1913, p. 303.
7. NAUMANN: Om prostatastem. *Hygeia*, Stockholm, 1912, LXXIV, 1136.
8. RAVASINI: Calcolo della prostata. *Fol. urol.*, 1909, IV, 49.
9. THOMPSON: *Brit. Med. Jour.*, 1912, II, 1709.
10. VOELCKER: Cited by Gläsel and Kretschmer.
11. PASTEAU: *Presse Med.*, Paris, 1912, p. 18.
12. DAUBERT AND BEAUJEU: *Archives d'electric, Med. Paris*, 1912, XXI, 591.
13. TOWNSEND: *Surg., Gyne., and Obstet.*, Chicago, 1916, XXIII, 685.
14. PETERKIN: Calculous Degeneration of Prostate. *Ann. of Surg.*, Phila., 1916, LXIII, 681.
15. BRICKNER: A Contribution to the Diagnosis of Prostatic Calculi. *Med Rev. of Reviews*, 1913, XIX, 163.

A PROTECTED CHAIR FOR ROENTGENOSCOPY *

BY HAROLD ZIMMERMAN, M.D.

Captain M. C., U. S. A.

SAN FRANCISCO, CALIF.

IN spite of our present day knowledge of the dangers arising from roentgen ray exposure, and the general protection of apparatus by the manufacturer, we still find many fluoroscopic tube boxes inadequately protected and leaking badly about the adjustable diaphragm. To the roentgenologist who spends long hours at screen work this question of protection from exposure may lead to a degree of justifiable apprehension. During the past year the amount of fluoroscopic work at the Letterman General Hospital suddenly grew to considerable volume, and in order to safeguard ourselves against excessive radiation we built a protected chair for roentgenoscopy which we think, by virtue of its simplicity and efficiency, might be considered worth while by other roentgenologists.

The general plan of this chair is shown in the accompanying illustration. In brief it is a modification of the ordinary straight back chair. The operator however does not *sit* in the chair in the usual position but *sits astride* the chair, the *back* of the chair becoming a *shield* intervening between the chest of the roentgenologist and the fluorescent screen.

The chair is preferably built of oak or some heavy wood to give it stability. It should be about the size of an ordinary chair, legs 19 inches high, seat 16½ inches square. The upright protecting shield of ¾-inch pine extends about 24 inches above the seat and also a short distance below the seat. This will permit it to extend well up under the chin, but is not high enough to interfere with full flexion of the neck as required in looking downward in gastro-intestinal examinations. The width of the shield is the same as the seat of the chair, 16½ inches, and on each side at the seat it is cut in about 2 inches for the knees. The shield should not be wide enough to interfere with the full freedom of the arms necessary in gastro-intestinal manipulations. The protecting plate, instead of slanting from the seat as in the ordinary chair, is made to slant toward the seat about 7 degrees, or to overhang the

* Authority to publish granted by the Board of Publication, Surgeon General's Office.

seat about 3 inches. With the shield in this position the chair is far more comfortable. It allowes a freer range of vision downward, and neutralizes the top-heaviness that arises from its lead protection. The upright chest board is covered on the outside with 1/16-inch sheet lead.

find how little the shield interfered with the approximation of the eye to the image.

For roentgenologists of smaller stature, the dimensions given above should be cut down proportionately.

This apparatus protects not only the genitals and the abdominal viscera but

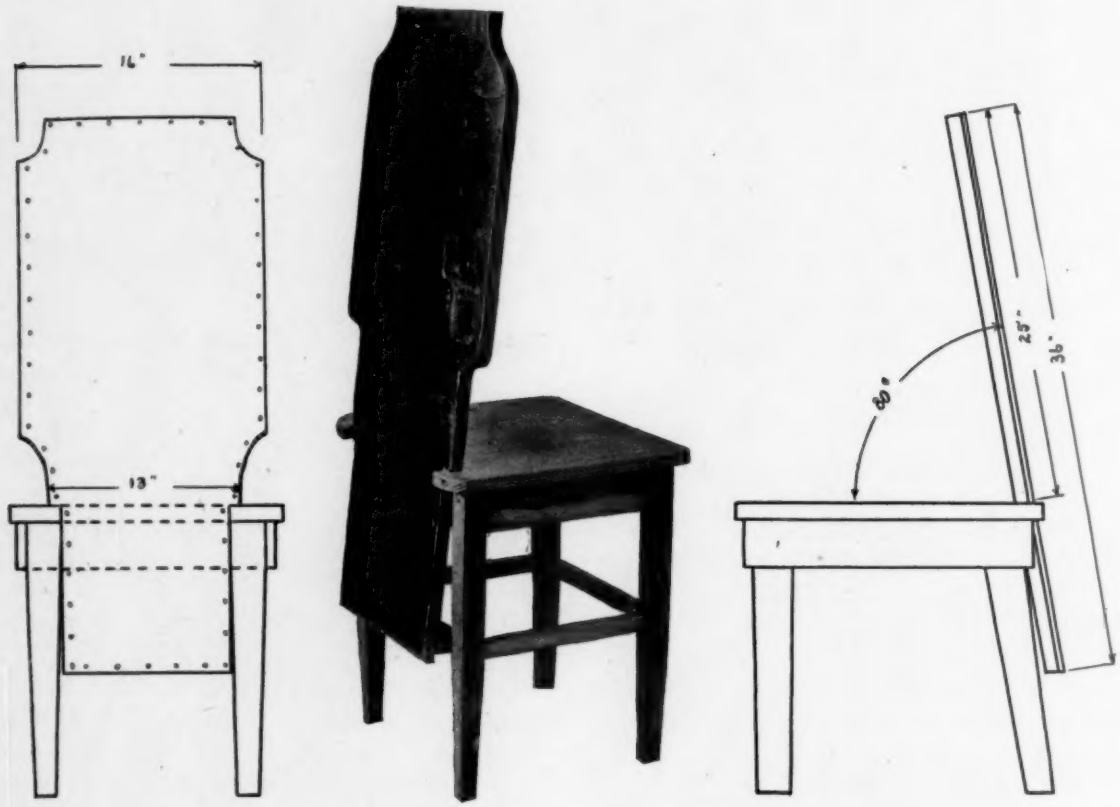

FIG. 1. THREE VIEWS OF PROTECTED CHAIR.

If this apparatus is supplemented by a 6-inch stool on which to stand short patients, it can be conveniently employed in practically all cases of upright fluoroscopy.

While the idea of this intervening plate between the body and the screen may seem awkward, we were agreeably su rprised to find this chair quite comfortable, and to

also the chest. We find it much more satisfactory than the false protection of a heavy leaded rubber apron hung from the shoulders. Wings for the protection of the thighs and legs might easily be appended, but we have preferred to use the chair in its original form, which seems to give the maximum amount of protection with the minimum of apparatus and inconvenience.

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FOREWORD

The vision of the early workers in roentgenology concerning its various fields of usefulness seems to have been well conceived, if the present activities indicate its future development. In the early days therapy in various diseases was attempted and diagnostic work of all sorts was undertaken, some of which was successful; other attempts, owing to lack of knowledge of the action of the rays and to mechanical difficulties, were failures and were given up.

Later, with broader and truer ideas gained by experience, some of the failures were reconsidered, successfully; the improved mechanical and electrical facilities of various types assisted materially in reaching a solution. These advances have been painfully slow at times, while again they have been almost meteoric in their swiftness. The problems are not all solved. Much remains which requires the attention of the most studious, most energetic and most enthusiastic.

A national society was organized years ago as a source of inspiration by the interchange of ideas, and with the extension of the work came the desire for a closer union between workers in certain localities, resulting in the formation of societies in large cities, as the Philadelphia Roentgen Society; or where the population was less centered, in the formation of sectional societies, as the Pacific Coast Roentgen Society. The great war has brought many new men into the field, most of whom received the excellent course of training offered by the army.

Most of these men will doubtless continue in the practice of roentgenology. They will probably constitute a considerable number of the future roentgenologists of this country. They are the ones who will supply the new ideas, and their vision should be very comprehensive, due to their having been closely associated with the best in foreign and American medicine.

Therefore a most hearty welcome is extended to every one who enters this field, whether it be as a pure physicist, a biological chemist, a pathologist, therapist or diagnostician. There is plenty of room for all.

PROCEEDINGS

Omaha Roentgen Ray Society

The Annual Meeting of the Omaha Roentgen Ray Society was held in Omaha, April 5, 1919. *X*-ray Clinics were held at St. Joseph's Hospital by Dr. A. F. Tyler and at the University of Nebraska Hospital by Dr. C. H. Ballard. The regular sessions were held in the ballroom of the Hotel Fontenelle.

The morning session was called to order by the President, Dr. A. P. Overgaard. Dr. A. F. Tyler of Omaha read a paper on Deep Therapy, and Dr. R. L. Smith of Lincoln gave a cinematographic demonstration of the massive dose method. Both Dr. Tyler and Dr. Smith advocated using the maximum amount of dosage with the minimum amount of filter which could be used with safety to the patient, disregarding, in extreme cases, the cosmetic effect in favor of the cure.

Dr. B. H. Orndoff of Chicago led the discussion and said that he had never used the extreme dosage advocated by Dr. Tyler and Dr. Smith. He suggested that the roentgenologists and the surgeons cooperate in a new manner—by operating inoperable cancers, removing whatever cancer tissue was possible and leaving the area exposed. This area should be covered with the adhesive plaster recently advocated for growing skin without grafting, furthered by massive doses of *x*-rays, thus giving the rays a much better opportunity to destroy the cancer cells. By this method of cooperation and working he believes the percentage of recoveries in the inoperable cases will be greatly increased.

Dr. W. P. Wherry of Omaha read a paper on the Value of Roentgenograms of the Accessory Nasal Sinuses. Dr. Wherry thought that a mere report that the sinuses were clouded was of little value, but stated that by improved technique the roentgenogram could be made of much greater value.

In discussing this paper Dr. H. B. Lemere endorsed the suggestions of Dr. Wherry and urged greater cooperation in this work, saying the rhinologist needed the assistance of the roentgenologist in interpretation of the plates.

The first paper on the afternoon program was by Dr. Boyd Gardiner of the Mayo Clinic, who stated that they used an ordinary dentist chair in making roentgenograms of the teeth, and outlined the method of placing the films to get the best possible results. He illustrated with blackboard sketches just how the film should be placed. He stated that 97 per cent of the people going through the dental department needed extractions. This paper was discussed by Dr. B. H. Harms of Omaha.

Dr. A. L. Smith of Lincoln, Neb., talked on the subject of Dental Infection in Children. He made a very earnest plea that this source of infection be carefully watched, urging the cooperation of the dentist with the pediatrist. He pointed out many cases in which dental infection had played a large rôle in the health of the child and in its future welfare.

Dr. J. B. Fickes in discussing the paper urged that the physician follow up his recommendation that the child visit a dentist and work in harmony with the dentist. Both Dr. Smith and Dr. Fickes believe that all pathological conditions should be removed even though this necessitates the early removal of the first teeth, believing that the detriment to the second teeth and to the jaw formation is of much less importance than the undermining of the child's general health by the constant infection.

Dr. W. L. Shearer of Omaha read a paper on "Dental Roentgenology from the Standpoint of the Oral Surgeon" discussing the method by which infection from the teeth is spread throughout the body by the lymphatic system.

Dr. O. H. McCandless of Kansas City talked on Roentgenology of the Gastro-Intestinal Tract. He outlined very fully his methods, and illustrated the talk with lantern slides.

Dr. W. W. Wasson of Denver gave an illustrated talk on Roentgenology of the Chest, going fully into the findings as shown by the roentgenogram.

Value of the *x*-ray from the Internist's standpoint was the subject of Dr. A. D. Dunn of Omaha. Dr. Dunn advocated the ***routine*** use of the *x*-ray in diagnostic work, but insisted that it was but a single method and that *x*-ray diagnosis is a misnomer. He said that it was a morphological method and that the future medicine lay in physiological and biochemical methods. He urged that the work should be done only by specially trained and experienced roentgenologists who should refuse findings with possible interpretations and not make diagnoses.

Dr. B. B. Davis of Omaha discussed the Value of *X*-ray from the Surgeon's Standpoint. He spoke of the surgeon's dependence on *x*-rays as an aid in diagnosis, but he also urged that emphasis be laid on the word "AID" because the surgeon who overlooks his ordinary clinical methods and trusts the *x*-rays alone is headed for destruction. When used in connection with every other diagnostic aid Dr. Davis said he would take his hat off to roentgenology as one of the greatest helps known.

Dr. Roeder led the discussion and corroborated the statements of Drs. Dunn and Davis as to the value of roentgenology as an aid and stated that he believed the ratio of its importance was about the same as the ratio of roentgenologists on the program, which had been prepared by them, to the rest of the profession present, i.e., one to ten.

A banquet was served at 6:30 at the Fontenelle and the evening session was given over to returned war heroes.

Capt. N. C. Prince spoke on the subject of The Mobile *X*-ray Unit on the Western Front; Captain C. N. O. Lear of Des Moines, Iowa, told of his Experience in the First Line Trench Work, and Col. A. E. Merritt of Council Bluffs gave a cinema demonstration of the U. S. roentgen field apparatus, and a comparison with the apparatus of the enemy.

It was gratifying to hear that Germany was using roentgen apparatus of American make, but so antiquated as to be unrecognizable by the American doctors, also to hear Dr. Prince's assertion that the American equipment was exceptionally satisfactory.

A. P. OVERGAARD,
President

WESTERN SECTION OF THE AMERICAN ROENTGEN RAY SOCIETY.

An unusually well attended and enthusiastic meeting of the Western Section of the American Roentgen Ray Society was held at the Hotel Statler, Detroit, Michigan, March 22, 1919.

The meeting was planned by the Detroit members of the Society with Dr. P. M. Hickey as Chairman. The day was divided into a morning session for the reading and discussion of papers, two hours at noon for a luncheon and inspection of the new roentgen department at Harper Hospital, an afternoon session for further papers and discussion, and a lantern slide demonstration in the evening following the customary banquet. Many of the men recently returned from France were present, as were also those who were in the military service in this country, so that the social aspects of the meeting were much appreciated.

Dr. A. W. Crane was elected Chairman and called the first session at 10 A.M. The first paper presented was by Dr. M. J. Hubeny of Chicago on Prostatic Calculi. Dr. Hubeny illustrated his paper by a number of lantern slides and during the discussion of the paper and slides, it was discovered that there was wide variation in opinion as to the anatomical relations of the prostate. Several slides shown were clearly cases of calculi in the deep urethra and not prostatic concretions as was supposed.

Dr. Emil Beck of Chicago presented

some original work on the combined treatment by surgery and deep therapy of inoperable deep seated carcinoma. Two patients from Chicago were shown and the results obtained by Dr. Beck were really spectacular. Dr. Eisen, who cooperates with Dr. Beck, discussed at length his method of application of the ray. The general discussion which followed Dr. Beck's and Dr. Eisen's remarks demonstrated forcibly the necessity for the standardization of the technique of deep roentgen therapy.

The paper of Dr. M. W. Clift of Flint on the fluoroscopic examination in injuries of the head was well received, since Dr. Clift had based his paper on his experiences in several laboratories in France. The routine fluoroscopic examination of the skull was urged in all head injuries, the ability of the operator to rotate the patient's head in all directions during the study giving a distinct advantage to the procedure.

It was indeed fortunate that both Dr. Crane and Dr. LeWald were on the program. Dr. Crane presented some original work on the measurement of the heart shadow and also presented in a clear manner the results of Bardeen's work on the estimation of the size of the heart. Objections to the Bardeen method were raised by roentgenologists of excellent internal medicine training, it being claimed that the new method was far from being as accurate as the old orthodiagraphic method. Dr. Crane answered the objections and convinced his critics that the Bardeen method was superior to any yet presented. Dr. LeWald's paper on the Heart of Aviators was fully illustrated by lantern slides, and the technique and apparatus used by the cardiovascular examiners of candidates for the air service was fully explained.

Dr. Case of Battle Creek continued his custom of presenting something new in roentgen examination of the gastro-intestinal tract by showing a series of slides illustrating cases of postoperative ileus. Dr. Case advocated the routine examination of patients who showed any abdominal symptoms following the laparotomy, for in this way an early diagnosis would be obtained and correct treatment instituted in practically all cases of the condition.

Dr. Bowen of Columbus had no formal paper, but he demonstrated a number of time-saving features in the laboratory.

The paper by Dr. Grier of Pittsburgh on the treatment of Hodgkin's disease brought out again the marked difference of opinion regarding the proper technique of deep therapy. With special reference to Hodgkin's diseases it was the author's opinion that sufficient exposure should be given during the first series of treatments, because in his experience no case of recurrent Hodgkin's disease responded fully to the treatment. This was somewhat at variance with the experience of the other men present.

Dr. Darling's paper "The Commercial Invasion of the Practice of Medicine by *X*-ray Technicians and Commercial Laboratories Practicing Under Trade Names" aroused considerable discussion. There was a consensus of opinion that the danger of commercial laboratories was being overestimated and that the way to combat it was to render the best possible service and to be at least fair in the matter of the fees for the roentgen examination.

The banquet over which Dr. Crane so capably presided was followed by speeches laudatory of Dr. Hickey. Dr. Case spoke of Dr. Hickey as a soldier; Dr. Bowen of Philadelphia, as a roentgenologist; Dr. Rollin Stevens of Detroit, as a confrère; Dr. Chene of Detroit, as a teacher; and Dr. Evans as an associate.

The outstanding features of the lantern slide exhibit were an unusual series of cases of primary carcinoma of the lung presented by Dr. Bryan of San Francisco, and some original work on the gastro-intestinal in cases of hysteria by Dr. Van Zwalenberg.

Wm. A. Evans,

Secretary

TRANSLATIONS & ABSTRACTS

LEVIN, OSCAR L. The Ultraviolet Rays in the Treatment of Chilblain. (*Jour. A. M. A.*, Vol. 72, No. 12, p. 855, Mar. 22, 1919.)

The invisible ultraviolet and infra-red rays are to the right and left of the spectrum. The red and infra-red rays are heat producing and penetrating. The violet and ultraviolet rays produce a minimum of heat but possess marked chemical properties, are readily absorbed and are of value for therapeutic purposes. It has been shown that the therapeutic value of the sun is derived from the presence of the ultraviolet rays. Chilblain is essentially an erythema occurring in those with poor peripheral circulation and disturbed vasomotor tone. The good results obtained with the ultraviolet rays in this disease are probably due to the direct effect of the rays on the peripheral vessels and blood stream. It is therefore suggested that the rays be employed in the treatment of the condition, but not to the exclusion of other local and general measures. They are not only of value in removing the lesions, but if used sufficiently early in those who have had previous attacks they may prevent a recurrence.

BRODEN, A. C., Rochester, Minn. Basal-cell Epithelioma (From the Dept. of Surg. Path., Mayo Clinic). (*Jour. A. M. A.*, Vol. 72, No. 12, p. 856, Mar. 22, 1919.)

SUMMARY

1. Our present series of cases represents 13.4 per cent of 2,000 cases of general epithelioma.

2. Basal and squamous cells can be shown intimately connected in a neoplasm.

3. It seems to be a well-established fact that a basal-cell epithelioma can change into a squamous-cell epithelioma, or at least into an epithelioma in which the squamous cells predominate.

4. Basal-cell epithelioma occurs more often in males than in females, the proportion being about 3:2 in favor of the former.

5. The disease occurs in patients past middle life; their average age is 56.7 years.

6. It occurs more often in farmers than in any other class of people.

7. A family history of malignancy and a personal history of injury play a negligible part.

8. Previous mole, wart, pimple, eczema, scab, ulcer, etc., are associated in 37.1 per cent of the cases.

9. The duration of the lesion shows a marked variation; it extends from three months to forty-five years, and averages seven years and one month.

10. Ninety-six and twenty-eight hundredths per cent of all the lesions occur above the clavicle.

11. Thirty-six and nineteen hundredths per cent of all the patients had been either operated on or treated with acids, carbon dioxid, etc., before entering the Mayo Clinic.

12. In approximately 75 per cent of all the cases treated at the clinic there was either one incision with the knife alone or one excision with the knife immediately followed by cautery.

13. Of the 54.1 per cent of patients heard from, 75.86 per cent are living, of whom 75.45 per cent report a good result.

14. In the cases in which a good result was reported, 74.68 per cent of the patients had either one excision with the knife alone or one excision with the knife immediately followed by cautery.

15. The patients treated with acids, carbon dioxid, etc., before entering the clinic did not get so good a result as those who had no previous treatment.

16. The low grade of malignancy of the neoplasm is evidenced by its long duration, lack of metastasis in a single case in this series, response to proper surgical treatment, and by the fact that 75.45 per cent of the patients reported living have been free from the disease on an average of six years, one and six tenths months.

17. Of the patients reported dead, fewer than one-third died from this disease.

18. Excessive exposure to sunlight as a cause of the neoplasm has not been borne out by the facts in our series of cases. It was noted that the hand, which is exposed to sunlight at least as much as any part of the body above the clavicles, did not show lesions.

19. Practically all of the neoplasms in our series had their origin in the germinal layer of the epidermis of the skin. Only one was demonstrated to have originated from a hair follicle.

ELY, LEONARD W., San Francisco. Legg's Disease: Arthritis Deformans Juvenilis: Osteochondritis Deformans Juvenilis: "Perthes's" Disease. (*Am. Jour. of Orth. Surg.*)

Under the title, "An Obscure Affection of the Hip Joint," Arthur T. Legg, of Boston, reported before the American Orthopedic Association, in 1909, a series of observations on five cases of a disease not previously identified, and published his paper in 1910. His report was brief, accurate and scientific. Very little definite has since been added to it.

In 1910, Perthes, of Tübingen, reported cases of the same disease, without recognizing their nature, publishing them as cases of Arthritis Deformans Juvenilis; that is, as cases of "arthritis deformans" in the young. In 1913 Perthes recognized that the disease bore little resemblance to what the Germans call arthritis deformans. Evidently he overlooked Legg's original paper. He excised from one patient a piece of the synovial membrane, and a piece of the head of the femur. The synovial membrane showed no sign of inflammation; therefore Perthes rightly concluded that the disease was not an arthritis. Neither the bone nor the cartilage showed evidence of inflammation, yet Perthes calls his "new" disease Osteochondritis Deformans Juvenilis.

Since 1913 many others in this country and in Germany have reported cases of the disease, and gradually the name Perthes's Disease has been adopted for it. A half-hearted attempt has been made in America to give Legg due credit, but I have never seen his name mentioned in the German periodicals. As the American Orthopedic Association is not a secret society, nor the *Boston Medical and Surgical Journal* an obscure periodical, one notes with amusement or irritation the recurrence of an oft-observed phenomenon.

Until the opportunity is afforded of examining some specimens in the laboratory, we shall lack definite knowledge of the disease, but the following facts, theories, and conclusions may be interesting.

Legg's disease is an error in development of the whole upper epiphysis of the femur—trochanter, neck and head. In this the acetabulum sometimes shares. It affects chiefly the head and the proximal lateral portion of the neck, and the cartilage between them. The great trochanter may or may not be involved.

It possesses a strong congenital element. It is first observed between the ages of five and ten. It is thought to affect boys more often than girls, in the proportion of 4–1; but, counting the cases observed with congenital hip dislocation, the disproportion is probably not marked.

It is often seen after reduction of congenital hip dislocation, occasionally on the sound side.

It is frequently bilateral, with symptoms only on one side.

In two cases a growth of staphylococcus has been recovered at operation from a softened area in the neck. One case showed a "necrotic" area, the other a "grayish" condition of the marrow. The pathological reports in these cases leave much to be desired. No evidence of an arthritis ever has been adduced.

It is hard to explain its causation by circulatory disturbances. Trauma probably does not cause it, but simply acts by spraining the distorted joint. Trauma often causes the symptoms but not the disease. Witness the frequent bilateral nature and the fact that almost invariably the *x*-rays show the complete and definite picture at the first examination. Then, in spite of treatment, or without treatment, the affection pursues a definite course, which no trauma would explain. This course may be modified by correct treatment, and the resulting deformity (coxa vara) avoided.

The areas of "destruction" (so-called), shown by *x*-rays, in the head, may possibly be areas of unossified cartilage. It is not likely that a destructive inflammation in the marrow of the head and neck could exist without symptoms, and without causing an arthritis, except as a great rarity. These irregular patches are standard in Legg's disease, occur with or without symptoms, and are present after healing apparently has occurred.

The typical roentgen picture consists in: (1) A flattening, broadening, and sometimes an apparent displacement of the epiphysis laterally, with one or more divisions of it and irregularity of ossification. (2) An irregularity or even segmentation of the cartilage between it and the neck. (3) Loss of bony structure in the neck, especially of its proximal and lateral part. (4) Irregularity in contour of the upper part of the femur neck. (5) Distortion of the head. (6) Enlargement of the trochanter (occasionally). (7) Irregularity of the acetabulum—not characteristic.

The astounding difference between the marked changes in the *x*-ray picture and the comparative insignificance of the symptoms and physical signs is characteristic.

The interesting query presents itself: Are all these changes due to some one special cause, or is one of them the essential change, and all the other changes its result?

The later picture shows a short thick neck, often coxa vara, and a distorted head. The chief symptoms, when symptoms are present, are limp and pain. Examination shows the limp, a prominent trochanter, and limitation, especially of abduction. Other motions may or may not be limited. A peculiar sign is the abduction at the hip when flexion is forced.

The affection seems to run its course in two or three years. Its most active period is one year. Even after all symptoms have subsided and a cure evidently has been obtained the *x*-ray may show an alarming picture.

Fibrous or bony union of the joint never occurs. The restriction of motion is mechanical.

In the past, Legg's disease often has been mistaken for tuberculosis, and cases of it have been quoted to swell the list of cures by some favorite treatment. The diagnosis as a rule is not difficult. Tuberculosis has more pain, more muscular spasm, greater restriction of motion and greater muscular atrophy. It shows radiographically more involvement on the shaft side of the epiphysial line and less in the head of the bone. It has not the same disproportion between the *x*-ray picture and the symptoms and physical signs.

As infection cannot be ruled out, any possible focus of infection in the body may be removed.

A good treatment consists in reduction of the deformity, if necessary under anesthetic, and the immobilization of the fully abducted hip in a short plaster spica until the process has run its course and the neck has firmly solidified. Crushing of the head is not to be feared.

Finally, as Legg described Perthes's disease three years before Perthes, the justice of calling it Legg's disease seems sure.

GRIER, G. W., Pittsburgh, Pa. *X*-ray Examination of the Heart and Great Vessels. (*Interstate Med. Jour.*, Vol. XXVI, No. 3).

The author classifies the information obtainable by roentgen ray examination of the heart into two classes: 1, facts regarding the size, contour, and location of the heart; 2, facts regarding the pulsations of, and the influence of, respiratory movements on the heart.

In considering the size of the heart there are three possibilities, that it is too small, normal, or too large. The undersized heart is not often seen, the author only mentioning two cases, and both of these showed marked evidence of cardiac weakness clinically.

The normal heart varies in size between rather wide limits. For descriptive purposes he divides the normal heart into three classes: 1, the small vertical (drop) heart of the asthenic individual; 2, the medium sized and obliquely placed heart of the average sized individual; 3, the large transversely placed heart of the large individual or athlete.

The small vertical heart lies with its long axis parallel with the long axis of the body. It is found in long-chested, thin individuals and is supposed to indicate a predisposition to pulmonary tuberculosis. Its vertical position is probably due to an unusually long chest, just as the transverse heart in a fat person is due to a large chest. Deep inspiration has a tendency to convert the vertical heart into one of the oblique variety, while deep expiration tends to convert the oblique heart into the vertical type.

The medium sized heart varies considerably in size, shape and obliquity. The right ventricle is not seen in a roentgenogram, being covered by the diaphragm. The right auricle projects about one inch to the right of the spine. It describes a decided curve and blends above with the aorta and vena cava, and below with the diaphragm. The left ventricle forms the greater part of the shadow seen to the left of the spine. Above this shadow of the left ventricle is a small bulge representing the left auricle, above this another bulge indicating the pulmonary artery, while still higher one sees the descending aorta and aortic arch.

The large transverse heart rests with its long axis almost at right angles with the long axis of the body, this position resulting from a short chest and high diaphragm.

Hearts that appear too large are either hypertrophied, dilated, or there may be a pericardial effusion present.

The dilated heart may enlarge in any or all of its chambers. Enlargement of only the right side of the heart shadow means a dilation of the

right auricle, and occurs in the tricuspid lesions. An enlarged left shadow occurs in mitral and aortic lesions. In mitral lesions of long standing followed by decompensation the entire heart is dilated, while in early cases of mitral lesions the left auricle only is affected.

Pericardial effusion causes an increase of the heart shadow with obliteration of the normal curves identifying the various heart chambers. The heart shadow becomes roughly triangular, with the apex above and the base below.

The heart may be displaced from various causes, such as pleurisy with effusion, fibroid phthisis, tumors in the mediastinum, and subphrenic abscess. Fluoroscopic examination is an important aid in differentiating these conditions.

Aneurysm of the ascending aorta without involvement of the arch is occasionally seen as a sacculated protrusion of the right border. Large aneurysms of the arch are always continued into the ascending and descending aorta. Occasionally one sees an aneurysm of the innominate artery. The differentiation between the mediastinal tumor and aneurysm is very difficult at times, especially when the aortic pulsations are transmitted through a solid mass and give us the impression of an expansile tumor. An important differential point is that the borders of an aneurysm are always smooth and convex, while most solid tumors are irregular and knobby. Also in aneurysm the tumor can be seen, upon rotating the patient, to be continuous with the aorta, while enlarged glands lie mostly behind the shadow of the spine.

The differential diagnosis of thymus or substernal thyroid is easier, as the tumor lies above the arch. They might be mistaken for an aneurysm of the innominate artery, but here again the position is an important aid in differential diagnosis. The thymus lies in the midline, while the innominate aneurysm lies to the right of the sternum; also the borders of the thymus are more apt to be concave or straight than bulging, as seen in aneurysm.

MUELLER.

BOGGS, RUSSELL H. The Value and Limitations of Radium in the Treatment of Cancer. (*N. Y. Med. Jour.*, March 22, 1919.)

The extensive use and satisfactory results of radium therapy in the hands of men of recognized authority have caused a rapid disappearance of the skepticism formerly held in regard to radium. It is now generally regarded as a valuable adjunct in the treatment of malignancy and uterine hemorrhage. The chief factor that has brought radium into disrepute has been in permitting patients or physicians to expect a cure when only palliation could be expected. Palliation is not to be regarded unfavorably when it frequently prolongs life and adds greatly to the comfort of the patient. Aside from epithelioma the majority of malignant cases treated are hopelessly inoperable, and even so, an occasional clinical cure may be expected, but cannot be promised. A second important factor is the improper use of radium from lack of knowledge of the proper technic or in too small amounts. It may do harm if improperly used. Too little may stimulate and too large a dose may irreparably damage normal structures.

In epithelioma radium is most gratifying in its results. Epitheliomata are divided into four groups. The first comprises those lesions that may be cured by a single local application, as epitheliomata of the upper part of the face, unless bone or cartilage are involved, and especially in early lesions involving the eyelids. The second group includes cases which metastasize early to near-by lymph glands, and in which the local lesion is treated by radium and the glandular and lymph channel areas by massive roentgenization. In epithelioma of the lower lip the results obtained by this method have justified its use. When properly applied to early superficial cases ninety per cent of cures may be expected without producing any marked deformity. Squamous cell lesions require two to four times more radiation than the basilar forms. The central lower lip and chin are drained into the submental glands, while the submaxillary glands receive the lymphatics from the lateral portions. The submaxillary salivary glands are closely connected and there is an anastomosis between the lymphatics draining the two sides and the central portion of the lower lip. Furthermore, the deep cervical glands connect with the submental and submaxillary groups. All these facts must be borne in mind in administering the treatment, and each link in the chain carefully treated by roentgen rays. The sub-

mental and submaxillary glands when enlarged should also be treated by radium application. The third group comprises lesions in which radium and roentgen rays will give palliation only; and the fourth, those in which excision is advisable followed by postoperative radiotherapy.

Epitheliomata of the mouth and throat are more resistant than lesions of the skin. Some results of radium therapy are brilliant and others disappointing, but the results warrant at least the consideration of radiotherapy in every case, either alone, as anti- and postoperative procedures, or as a palliative measure. Roentgenization of the cervical lymph glands is imperative, whether they are apparently involved or not. Where extreme caustic power is not necessary for the primary lesion other methods such as electric coagulation may give better results. This has the great advantage of destroying tissue without the danger of serious hemorrhage. Sarcoma of the nasopharynx is more amenable to radium therapy than carcinoma, and large growths may be made to disappear in four to six weeks. In deeply ulcerating carcinoma sufficient radiation is given to produce a marked reaction, and when this disappears in two to four weeks either electric coagulation or a repetition of radium is employed.

In carcinoma of the uterus radium is indicated as a palliative measure for inoperable and recurrent cases and for operable cases with constitutional contraindications. When recurrence or metastasis takes place the patient has an interval of nearly or quite normal health as a rule and suffers much less than those not receiving radium treatment. In hopeless cases the discharge and hemorrhage are much lessened or disappear entirely. In primary operable cases, either anti- or postoperative radiation or both are advisable.

In carcinoma of the rectum and bladder the same favorable results from either the curative or palliative treatment are not obtainable. The epithelium of these structures will not stand the amount of radiation possible without harm to the healthy mucous membrane of the vagina. H. PANCOAST.

BECK, EMIL G., M. M., F. A. C. S., Chicago. Bismuth Paste in War Surgery. (*Jour. of the Minnesota State Med. Assn.*, Vol. II, No. 5, May, 1919.)

Errors in Technique.

1. The method is often applied indiscriminately, without control by radiograms.

2. The mixture, when injected, is not sufficiently liquefied to fill all the sinuses and suppurating cavities.

3. The bismuth is applied in cases in which either a sequestrum or infected foreign body is at the bottom of the trouble.

4. The injections are often kept up after the wound is sterilized and thus no chance is given for healing.

5. The instruments used are often improvised and unsuitable.

6. The bismuth mixture is very often spoiled by the accidental mixture of a few drops of water. (Syringes should be perfectly dry when used.)

The sinus or fistula is nothing more than a shrivelled abscess or abscesses. It leads from its opening on the skin or into the bowel to the place where the disease originated, and this focus of disease is often at a considerable distance from the opening or openings of the sinus. It is therefore inconsistent to try to eradicate the suppuration by only dissecting the sinus tracts. With the radiographic reproductions of the labyrinths or sinuses before us, an attempt to dissect the same would be absolutely hopeless.

If the focus from which the sinus originated is reached and disinfected, in practically all instances the sinuses will close up. It is therefore essential that when a fistula or sinus is injected with bismuth paste, it must reach the focus of the disease. If, through faulty technic, this is not accomplished, good results cannot be expected.

Indication

A. All sinuses resulting from chronic suppurative joint affections, tuberculous as well as non-tuberculous. This includes the sinuses especially after spondylitis and hip joint diseases.

B. Sinuses after osteomyelitis of long bones and flat bones, including ribs.

C. Sinuses resulting from suppurative diseases of parenchymatous organs, such as the kidney and other glandular structures in the body, including suppurative tuberculous glands.

D. Post-operative sinuses which sometimes remain after draining infected wounds.

E. Sinuses after empyema of the pleura or from lung abscess.

F. In cases of abscess and suppuration of the mammary glands.

G. In all infected wounds due to crushing injuries.

H. In infected and long suppurating war wounds due to shrapnel or bayonet injury.

It has already been tested in these and found most effective. The rapid accumulation of this class of cases due to the present war in Europe will furnish a tremendous amount of material for treatment.

I. In rectal fistula or pararectal abscesses.

K. By otolaryngologists in the treatment of suppurative antrum disease and accessory sinuses, as well as in the after treatment of mastoid operations.

L. By dentists in suppurative sinuses about the teeth and jaws and in pyorrhea alveolaris.

M. It has also been used by us in chronic endometritis.

N. In the prevention of sinuses by incising the cold abscess and injecting it with a five per cent bismuth paste.

Summary

To insure success in employing bismuth paste the essential points are summarized as follows:

1. One should make a correct diagnosis by all the methods at his disposal and corroborate the same with stereoscopic radiograms, before an injection is made.

2. Before attempting to employ this method one should acquaint himself thoroughly with the technic.

3. The proper instruments should be employed in order to carry out the technic correctly.

4. The patient should be kept under constant observation to prevent bismuth intoxication.

5. Examine the secretions from the sinus before the first injection, by slide and culture, and often by the inoculation of guinea pigs; then three days later test the sterilizing effect of the injection.

6. As long as the sinus contains microorganisms it should be reinjected but if it is found sterile, it should not be reinjected.

7. It is good practice to wait at least one week after the first injection before repeating it.

8. A stereoscopic radiogram of the parts affected should always precede the first injection, in order to detect the presence of foreign bodies. The shadow of the paste might make their presence obscure.

9. Following the injection a second set of stereoscopic radiograms should be taken in order to make a correct anatomical diagnosis.

10. In case a foreign body or sequestrum is present, the injection is useless, operation the only means.

11. Acute suppurative processes should not be treated with bismuth paste, only chronic suppurations, both tubercular and non-tubercular.

12. Bismuth poisoning may be easily prevented by using only small quantities or when large quantities are required they should not be retained longer than ten days, and the patient should be carefully watched.

13. Fecal fistula and other post-operative sinuses are very favorably affected by bismuth paste treatment.

14. A ten per cent bismuth vaseline may be used in cold abscesses. In practically all instances the secondary infection can be prevented, providing the technic is carefully observed.

SITTENFIELD, MAURICE J., M.D., New York. Radiotherapy in Cancer: Summary of Six Years' Experience in the Treatment of Malignant Diseases. (*Med. Rec.*, March, 1919.)

The author laments the lack of uniform technique and the difference of opinion in regard to dosimetry. He enumerates the different devices of quantimeters, electroscopes and intensimeters, all rather too complex for common use. Also the different means of filtration, different thickness of the filters and focal distanes. He regards a three millimeter aluminum filter and a focal distance of six inches when possible as the ideal procedure. The difficult question of penetration he regards as simplified by the improved tubes.

In analyzing the results of treatment of cancer cases the author finds a marked increase of success since the advent of the Coolidge tube.

The final test for cure is the complete eradication of all cancer cells from the body. Many failures are due to the fact, as shown by Ewing, that while cellular and rapidly growing tumors are favorably acted upon, fibrous tumors of

long standing, as in Hodgkin's disease, are not responsive to roentgenotherapy.

A difficult factor to define is the constitutional resistance of the patient. There is no dependable index; the high percentage of lymphyocytes might, according to Murphy, be indication of experimental cancer, but it does not hold true in clinical cancer.

A very important step forward in our fight against cancer is the closer cooperation between the surgeon and the roentgenotherapist; to get the best ultimate result, the treatment must start while the patient is in the prophylactic stage, that is, when the patient is recovering from the primary operation; in recurrent cases, the resistance to radiotherapy grows greater in time. In cachectic cases the greatest efforts must be used; there is almost always a psychological benefit derived from it.

As for selecting cases favorable for roentgenotherapy, the superficial basal cell epitheliomata are first, while the squamous cell epitheliomata do not react so readily.

PEER LUND.

SAYÉ, DR. L. Examen Radiologico de las Cavernas Tuberculosas del Pulmon. (*Archivos Españoles de Fisiologia*, Vol. I, No. 1, p. 105, Barcelona, Jan., 1919.)

In the preface to his article Dr. Sayé points out the enormous advantage for the clinicians to be able to compare the clinical findings with the very exact findings of the roentgenograms and thus base treatment, especially the pneumothorax treatment, more correctly. The importance of the fluid level in cavities is emphasized.

In the study of the cavities he has made the five following divisions: 1. Cavities of the usual type similar to those described by Bouchard. 2. Giant lobar cavities. 3. Cavities in formation or cavitation in the caseous stage. 4. Different anomalies of cavities. 5. False cavities.

1. *Cavities* of the usual type may either be very clearly defined by a thin wall with a horizontal line showing the fluid level or may also have distinct walls surrounded by either clear or infiltrated tissues. The cavity in the only slightly infiltrated tissues is the most frequent type and found in chronic fibro-caseous cases, while the cavities with sharply defined walls and dense infiltrations usually are seen in fibrous cases and are usually multiple.

2. *Giant cavities* involving an entire lobe are Dr. Sayé's second division; in these only the inferior border can be outlined, while the other walls appear contiguous with the pleura and the mediastinum. Aimard pointed out how easy it is to confuse the concave outline of the rib with the inferior outline of the giant cavity; but one ought always be able to see the broncho-vascular ramifications in the normal lung tissue.

3. *Cavities* in formation, giving the picture of a cavity formed by the breaking down of lung tissue, usually consist of an area in the middle of a shadow of infiltration with a ring shaped wall but instead of a clear space, the inside being perfectly filled with caseous matter and detritus; and these are rather harder to diagnose. Under this heading he also includes the multiple cavity formation described by Mantoux and Maingot as the "bread crumb" and "honeycomb" pictures. Another type under this division is the cavity apparently made up of a conglomeration of shadows and clearer spaces and found by autopsies to be a half formed cavity with only a fraction of the wall formed.

4. *Anomalies of cavities.*—The most frequent form is the cavity with the ringed shape roughened walls, and is usually situated in the parenchyma with very slight infiltration. Aimard has described these as being due to dry cavities without any signs of activity and apparently in the process of reparation; but the author proves that although their activity seems to be very slight there is a distinct focus which might flare up during a very slow evolution.

5. *False cavity* images or pseudo cavities where the lung markings and vessels in perfectly healthy parenchyma may assimilate ring shaped walls.

Other facts about tuberculous cavities have been demonstrated by means of the roentgen ray, as for example the greater frequency of cavities on the left side compared to the right; another important thing is the demonstration of the so-called clinically latent cavities.

The illustrations accompanying the article of Dr. Sayé are remarkable for their clearness and their well defined lung markings, and furthermore are well worth mentioning on

account of the rather unusual new method in pointing out the lesions and especially the cavities by outlining them on superimposed tissue paper, thereby greatly facilitating the work of the student.

P. M. LUND.

VAUGHAN, ROGER T. Primary Suture of War Wounds. (*Surg., Gyn. & Obst.*, April, 1919.)

In discussing the examination of the patient before operation, he states:

"The use of the *x*-ray, either by plates or, more usually, the fluoroscope, is desirable if not always absolutely essential for the successful removal of foreign bodies. The army localization of foreign bodies has reached a high degree of development, and is practically always used in U. S. units when available. The experienced surgeon can follow up the track of the projectile quite successfully in many cases without fluoroscopic aid. But in cases where two projectiles enter through one opening or where the missile breaks up after entering the body and makes a Y-shaped track, the *x*-ray is indispensable. Furthermore, it often warns the surgeon in advance as to difficulties he will encounter in following the track at operation. In some cases it reveals the presence of a wound or fracture which clinical examination was not certain of or had missed entirely. In the case of simple penetrating wounds, however, where it is relatively easy for the surgeon to follow the track, the *x*-ray examination is sometimes omitted in French practice (though not in the U. S. service) to save time. This omission cannot be recommended in civilian practice.

"In the case of multiple wounds, such as hand grenades, buckshot, glass splinters and the like, a special fluoroscopic operating table is necessary equipment if all foreign fragments are to be removed within a reasonable space of operating time. Unfortunately, fluoroscopic tables are not available in many hospitals, army or otherwise.

"The points which are painful to percussion in the neighborhood of the wound must be examined more closely for evidence of gas. The fluoroscope or *x*-ray plates may reveal gas in the tissues. It may show very distinctly in the plates, infiltrating along the muscle planes and underneath the skin. Once seen in the *x*-ray, it can also be shown clinically. Such wounds must not be sutured primarily; but after primary excision and special care to remove all dead muscle, they must be left wide open with a light gauze dressing and, in favorable cases, may subsequently permit of secondary suture."

BATTEN, GEORGE, M.D., C.M. Presidential Address to Roentgen Society, November, 1918. (*The Journal of the Roentgen Society*, No. 58, Vol. XV, January, 1919.)

"Whatever electrons may be, whether rarefactions, kinks or whirls in the ether (and I believe that they are some sort of interruptions in the continuum of the ether, because that theory seems to be at present the most tenable, if for no other reason than that it gives the best explanation of gravitation that I have heard), yet they belong to the physical world. We can understand the possibility of evolution from these, forming first the simpler atoms, such as hydrogen and helium, and then the atoms of radium and uranium with their much greater number of electrons; the gradual formation of molecules and compounds, such as that common, but peculiar molecule of water, which has such remarkable properties, until at last we reach the very complex molecules of organic substances and the comparatively huge molecules that form the physical basis of protoplasm.

"We can realize, as Sir Oliver Lodge points out, that mere increase of size may produce certain properties impossible in smaller atoms and molecules. For instance, small celestial bodies cannot retain an atmosphere, because the maximum pace of travel of the gaseous atoms from their surface is greater than their gravity can control; but larger celestial bodies, from about the magnitude of our earth, can control the travel of these gaseous atoms and therefore retain an atmosphere of some sort.

"We can understand how the possession of an atmosphere allows an evolution to take place in living organisms, until at last conscious sentiment beings are evolved that can live and think.

"We know that still larger aggregates of matter, like our sun, retain the power of radioactivity and provide also the source of heat, light and electricity that enables life to continue on its planets.

"As far as we know at present, even among

atoms themselves radio-activity only occurs spontaneously in the very heaviest of the whole series: probably in the future we shall find that it does occur to a less degree in others, and some day we may find a means of breaking up the atom and using the great store of intra-atomic force, which at present we cannot do outside a vacuum tube.

Allowing that evolution of the purely physical forces can by their actions and reactions and by a process of evolution form a substance with immense molecules—that is, protoplasm, and that this substance exists in aggregates with or without a limiting membrane—can we believe that this aggregate, or cell, can by its mere size develop or attain to a new property, the property of life? The Monists, such as Haeckel and his disciples, say that it can, and that life is nothing more than a form of energy, inherent or immanent, in matter from the beginning, immanent, in other words, in those minute aggregations of moving electrons.

"If this is so, then when an aggregation of molecules of protoplasm constituting a living cell dies, this living energy must either cease to be or must be transferred into some other form of energy. If it is simply a form of motion of the same order as those causing heat and light, we cannot conceive of its ceasing to be, therefore we must believe it is transformed into some other form of energy. We can find no evidence of this happening.

"What then is Life? Whence did it come? We do not know, but I believe, as do most modern thinkers, that Life is something apart, and can exist apart from the Material Universe, from electrons, atoms and molecules, that it is in fact a separate creation of a different order altogether from the material world.

"This life comes into relation with certain aggregates of matter, makes use of, and exercises control of them and by causing re-actions in, and among them, imbues them with new properties, which are the manifestations of what we call Life in them, of growth, maintenance and reproduction. When this Life ceases to have this relation with matter, it returns with or without acquired individuality to the continuum whence it came.

"We all know that the motion of electrons and their aggregates, which gives rise to effects that we call heat, electricity and *x*-rays, can and do modify the growth, nutrition and reproduction of living cells.

"How can we picture to ourselves the effects of *x*-rays upon cells? Do these waves in the ether act upon the life which for the time being is in relation to the matter in the cell? I do not believe it, but rather that they act directly upon the movements of the electrons within the atoms of the cell, and that the life of the cell is able, more or less, to take advantage of this altered movement.

"If the action of *x*-rays is such as to accelerate the motions of the electrons in atoms and molecules without in any way altering their structure, then life can utilize these activities for increasing growth and reproduction. If, however, the action of *x*-rays accelerates or retards the motions of the electrons so that some of the electrons are discharged, and the protoplastic atoms are changed in constitution, then life may be less able to make use of these new combinations, and therefore growth and reproduction are less manifest, that is, they are retarded.

"Should the action of *x*-rays be great or prolonged it may cause such accelerating or retarding of the electrons, that the protoplasmic atoms are altered so much in constitution that life can no longer enter into relation with them or make use of them, then the cell dies.

"Although it may seem childish to say so from this chair, all this shows that Life is not Electricity, and Electricity is not Life, despite some statements to the contrary that are often seen, and not only in advertisements for quack remedies. The passage, for instance, of a nerve impulse along a nerve, although analogous to the passage of an electric current along an insulated wire, does not travel the same pace, does not obey the same laws, and is not, in fact, a passage of electrons along that nerve, though often associated with the passage of ions through the nerve or other tissues."

WHY NEW TRIAL WAS DENIED IN MALPRACTICE CASE (Campbell v. Peters. [Me.], 102 Atl. R. 881. Ref. *J. Am. M. Ass.*, Vol. 71, No. 10.)

The Supreme Judicial Court of Maine, in overruling a motion made in behalf of the defendant for a new trial, after the plaintiff had obtained a verdict for some sum not stated by the court, says briefly that this was an action brought by the plaintiff against the defendant for alleged malpractice in the performance of a surgical operation. The case came up on motion for a new trial on both the ground of liability and the damages awarded. On the question of liability arose the usual conflict of testimony between medical men when called to testify on the one side and the other of a medical or surgical case. The jury found for the plaintiff on this issue, and its verdict, if accorded the benefit of the well-established rules of law, should not be disturbed. Nor does the court think, under the testimony, that it would be warranted in cutting down the amount of the verdict. The jury is as much a part of the judicial system, under the constitution and laws, as the presiding justice or the law court. While this court might have a different judgment from the jury in a case, it is not authorized to substitute its judgment for the jury's, when the jury has exercised a judgment not so inconsistent with the most favorable interpretation the evidence will bear as to indicate bias, prejudice or improper influence.

A CORRECTION

May 11, 1919.

Dr. H. M. Imboden,
480 Park Ave.,
New York City.

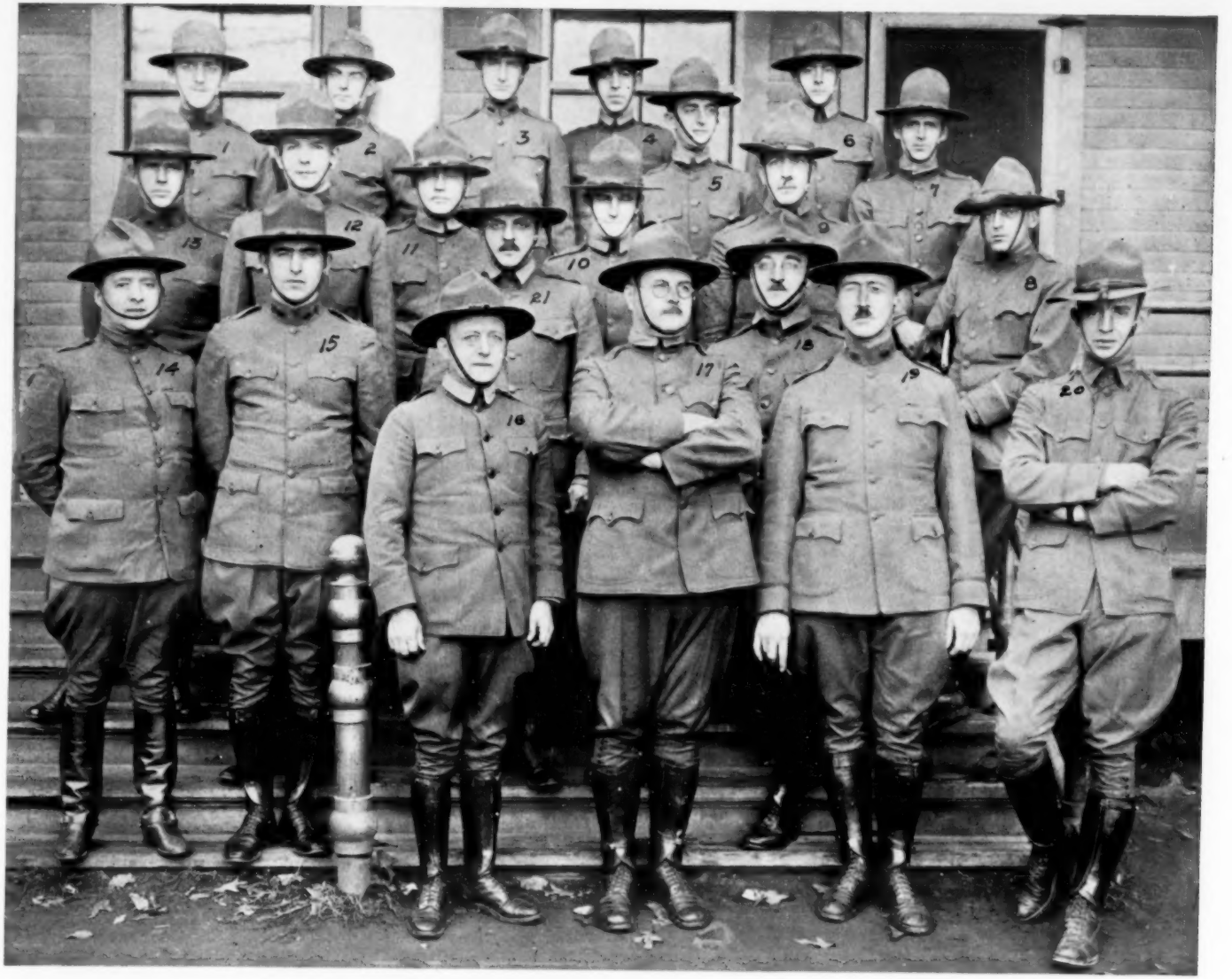
DEAR DOCTOR IMBODEN:

In the April number of THE AMERICAN JOURNAL OF ROENTGENOLOGY, on page 192, there has been an error in the position of the cuts illustrating my paper on "Esophago-Tracheal Fistula." The cut labelled Fig. 1 is really Fig. 2, and vice versa. As they stand, the legends are meaningless.

Will you kindly call attention to the correction, in the next number, if possible.

Very truly yours,

ISAAC GERBER.



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